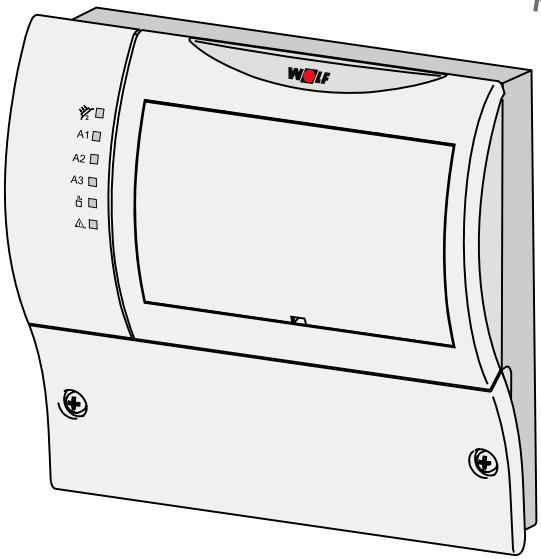
Die Kompetenzmarke für Energiesparsysteme

Installation and operating instructions

SM2 solar module

NEW

"Solar boiler stop"



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Part no. 30 62 438 Subject to modifications 03/09 GB

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Safety instructions

The following symbols are used in conjunction with these important instructions concerning personal safety, as well as operational reliability.

"Safety instructions" are instructions with which you must comply exactly, to prevent risks and injuries to individuals and material losses.

Danger through 'live' electrical components.
Switch OFF the ON/OFF switch before removing the casing.

Never touch electrical components or contacts when the ON/OFF switch is in the ON position. This results in a risk of electrocution that may lead to injury or death.

The main supply terminals are 'live' even when the ON/OFF switch is in the OFF position.

Note "Note" indicates technical instructions that you must observe to prevent material losses and boiler malfunctions.

Standards / Regulations

Standards / Directives

The appliance and control accessories comply with the following regulations:

EC Directives
- 2006/95/EC Low Voltage Directive
- 2004/108/EC EMC Directive

EN Standards
- EN 60730-1
- EN 55014-2
- EN 60529

Installation / Commissioning

- According to DIN EN 50110-1, only qualified electricians may carry out the installation and commissioning of the heating control unit and connected accessories.
- Observe all regulations stipulated by your local power supply utility and all VDE or local regulations.
- DIN VDE 0100 regulations regarding the installation of high voltage systems up to 1 000 V.
- DIN VDE 0105-100 operation of electrical systems.

Warnings

- Never remove, bypass or disable safety and monitoring equipment.
- Only operate the system in perfect technical condition. Immediately remove / remedy any faults and damage that may impact on safety.
- Always ensure that cold water is mixed in with hot water, when the DHW temperature is set above 60 °C (risk of scalding).

Maintenance / Repair

- Regularly check the perfect function of all electrical equipment.
- Only qualified personnel may remove faults or repair damage.
- Only replace faulty components or equipment with original Wolf spare parts.
- Always maintain specified electrical protection values (see specification).

Note Any damage or loss resulting from technical modifications to Wolf control units is excluded from our warranty.

Terminology

Collector temperature
The collector temperature is the medium temperature that is generated by insolation at the collector.
The collector temperature is measured at the flow outlet of the collector or collector array.

DHW cylinder temperature
The cylinder temperature is the temperature that is measured in the lower area of the cylinder at the level of the indirect solar coil.

Flow rate
The flow rate is the volume of medium that is transported by the solar circuit pump through the solar circuit. The flow rate in is quoted in l/min.

Yield
This is the volume of heat generated by the solar thermal system. It is calculated from the flow rate and the temperature differential between the collector and the return temperature. This is a value that is added up over a certain period (day) or given as overall total. The yield is quoted in Wh, kWh or MWh.

Output
The heat output represents the volume of heat generated during a certain period. This value represents a momentary value and is quoted in kW.

Solar cylinder
The solar cylinder is the cylinder that is heated up by the solar thermal system.

Solar thermal
Heating up of the cylinder via the solar circuit pump.

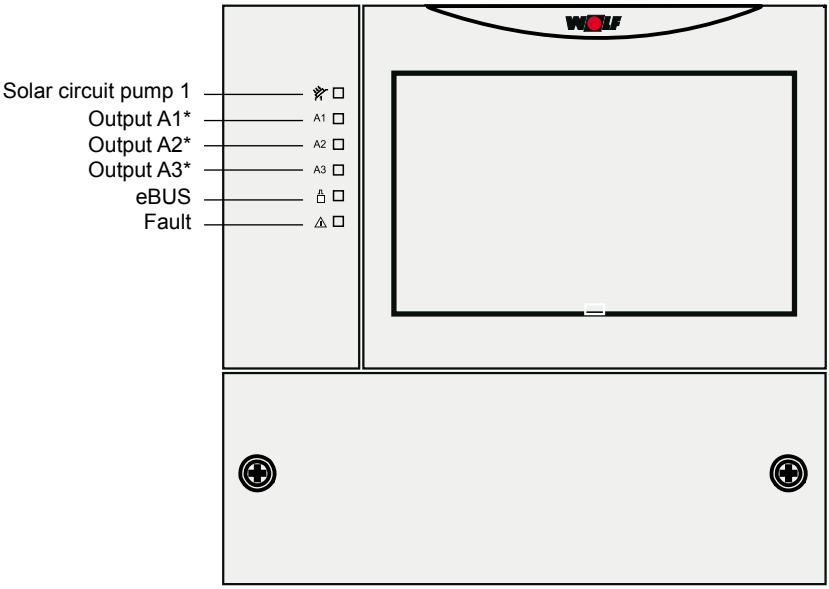
Solar circuit pump
The pump that circulates the medium in the solar circuit.

Abbreviations

SFK1	-	Solar sensor, collector, collector array 1
SFK2	-	Solar sensor, collector, collector array 2
SFS1	-	Solar sensor solar cylinder 1
SFS2	-	Solar sensor solar cylinder 2
RLF	-	Return sensor
BPF	-	Bypass sensor
PF	-	Buffer sensor
DFG	-	Flow rate transducer
SKP1	-	Solar circuit pump 1
SKP2	-	Solar circuit pump 2
CIR.	-	DHW circulation pump
USP	-	Transfer/de-stratification pump
3WUV1	-	Three-way diverter valve 1
3WUV2	-	Three-way diverter valve 2
el.V1	-	Motorised valve 1
el.V2	-	Motorised valve 2

Appliance description

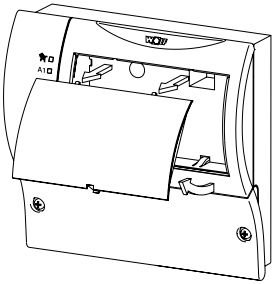
The solar module (SM2) is designed to regulate solar thermal systems with up to two collector arrays and two solar cylinders.
The system is fine-tuned by selecting from eleven preconfigured systems.
Heat metering may be possible, subject to the selected system.
For this, the heat amount can either be captured through determining the yield by recording the actual flow rate with a heat meter set (accessory) or by calculating the yield with a specified flow rate (requires a return sensor).
Parameters can be modified, and values as well as fault codes can be displayed with the programming modules BM or BM-Solar.
The SM2 has an eBUS interface and can therefore be integrated into the Wolf control system.



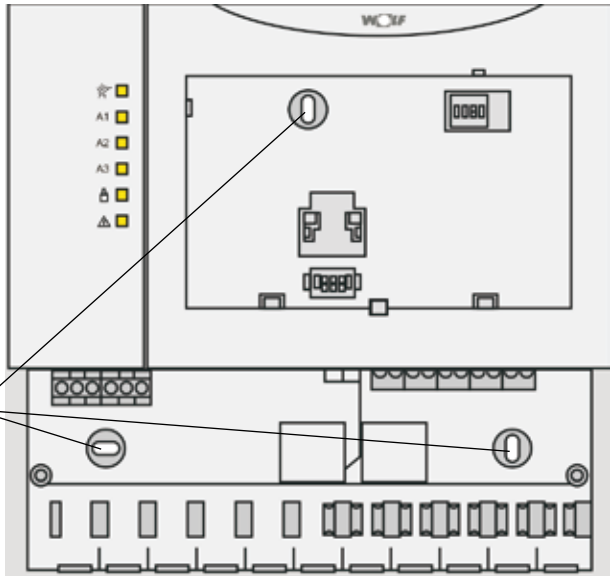
* Assignment of outputs subject to the selected system version

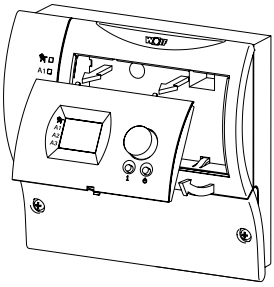
Solar module installation

- Remove the solar module from its packaging.
- Mount the solar module directly on the wall.
- Wire up the SM2 solar module in accordance with the wiring diagram.



Note: Never route on-site cables/leads for temperature sensor, flow meter and eBUS together with mains power cables.





A programming module BM or BM-Solar can be clicked into the solar module. As an alternative, the programming module can also be used as a remote control unit in conjunction with a wall mounting base.
No separate programming module is required if the solar module is integrated into a Wolf control system that already contains a programming module BM.

For further details, see the operating instructions of the programming module BM or BM-Solar.

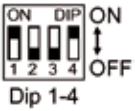
DIP switch settings/ Operating modes

DIP switch settings
Switching the solar module ON / OFF

A 4-pole DIP switch is located inside the solar module casing. This becomes accessible after removing the cover or the programming module.

DIP switch 1 enables the module to be switched ON and OFF. The anti-seizing pump protection continues to be active even when the module is switched OFF.

Factory setting:



Dip 1-4

DIP switches 2 and 3 are not relevant here.

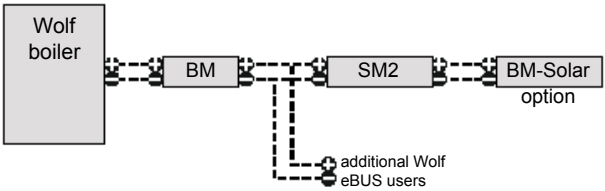
DIP switch 4 **must** be set to ON.

Operating modes

The SM2 solar module can be operated in different modes.

a) SM2 as part of a Wolf control system

The SM2 solar module can be integrated into a Wolf control system. In that case, the solar module will be controlled from the programming module BM with address 0. An optional programming module BM-Solar can also be linked to the SM2. In that case, the system can be controlled from the BM with address 0 and from the BM-Solar.



If the solar cylinder is assigned to another BM, the system can also be controlled from that BM. In systems with two cylinders that are assigned to two different BMs, the solar module can also be controlled from those two BMs (see parameter description *SOL07* / *P07* and *SOL17* / *P17*).

Note:
Only **one** SM2 can be integrated into any one Wolf control system.

b) SM2 (stand alone) with BM-Solar programming module

The module will be controlled by the BM-Solar programming module.

The BM-Solar can be clicked into the SM2 solar module or can be used as a remote control on a wall mounting base (accessory).

c) SM2 (stand alone) without programming module

The solar module is operated without programming module. Operation and selecting values is then not possible.

The status of outputs and faults can be identified by the LEDs in the enclosure front.

System overview

The SM2 solar module contains eleven different systems with up to two solar cylinders and two collector arrays. Parameter 12 - system configuration enables the selection of the most suitable system.

System overview:

System config-uration	System	Number of solar cylinders	Number of collector arrays
1	Single circuit system	1	1
2	Single circuit system with return temperature raising for central heating backup	1	1
3	Dual-circuit system with two solar cylinders in parallel operation	2	1
4	Dual-circuit system with two solar cylinders with cylinder priority control	2	1
5	Dual-circuit system with two collector arrays and two solar circuit pumps	1	2
6	Dual-circuit system with two collector arrays and one solar circuit pump	1	2
7	Dual-circuit system with two collector arrays, two solar cylinders with cylinder priority control and two solar circuit pumps	2	2
8	Dual-circuit system with two collector arrays, two solar cylinders with cylinder priority control and one solar circuit pump	2	2
9	Single circuit system with bypass circuit	1	1
10	Dual-circuit system with two solar cylinders with cylinder priority control and bypass circuit	2	1
11	Dual-circuit system with two solar cylinders with parallel cylinder operation with bypass circuit	2	1

System configuration 1
Single circuit system
(for layout, see page 16)

If the temperature differential between collector and solar cylinder exceeds the selected start differential, the solar circuit pump will be started, and the cylinder will be heated up to the selected maximum cylinder temperature (temperature differential control).

System configuration 2
Single circuit system with return temperature raising for central heating backup
(for layout, see page 17)

The buffer cylinder will be heated if the temperature differential between the collector and the buffer cylinder exceeds the start temperature.
When the buffer cylinder temperature is adequate, the heating return will be routed via the buffer cylinder, thereby raising the return temperature.

You can use system configuration 2 also for transferring heat between two cylinder, e.g. with connection set Solar CGS / CGW / CGI (part no. 27 44 465).

System configuration 3
Dual-circuit system with two solar cylinders in parallel operation
(for layout, see page 18)

With cylinder priority control, the cylinder with priority will be heated first. If during priority heating the temperature differential between the collector and the cylinder with priority exceeds the selected value for parallel cylinder operation, the lower ranking cylinder will be heated in parallel to the cylinder with priority.
This utilises the excess energy that cannot be transferred to the cylinder with priority to heat the lower ranking cylinder.

System configuration 4.0
Dual-circuit system with two solar cylinders with cylinder priority control
(for layout, see page 19)

With priority control, only one of the two cylinders can be heated at any one time.
Initially, the cylinder with priority is heated, until its maximum cylinder temperature has been reached or until the collector temperature is inadequate for heating.
After heating the cylinder with priority, the system changes over to heat the next cylinder in the sequence. If during the heating of the lower ranking cylinder it is recognised that the cylinder with priority can be heated again, the system changes back to that cylinder.
If, within 30 min. there is no changeover to the cylinder with priority, the solar circuit pump is switched OFF, and the resulting collector temperature is evaluated. If, with the pump idle, the collector temperature increases far enough to enable the cylinder with priority to be heated, the system reverts to that cylinder. If not, the lower ranking cylinder will continue to be heated.

System configuration 4.1
Function description for single circuit systems with two indirect solar coils inside the cylinder
(for layout, see page 20)

The solar module regulates the zone heating inside the cylinders using temperature differential control. For this, the cylinder temperatures are compared at two different points (top and bottom) with the collector temperature. Subject to the prevailing temperature, the solar circuit pump is either switched ON or OFF, and the upper (priority operation) or lower section of the cylinder is heated via the three-way diverter valve.

Initially, the upper section is heated, until its maximum temperature has been reached or until the collector temperature is inadequate for heating. After heating the upper section, the system changes over to heat the lower section. If during the heating of the lower section it is recognised that the upper section can be heated again, the system changes back to heat the upper section. If, within 30 min. there is no changeover to the upper section, the solar circuit pump is switched OFF, and the resulting collector temperature is evaluated. If, when the pump is idle, the collector temperature rises far enough to enable the upper section to be heated again, the SM2 module changes over to heat the upper cylinder section. The lower section continues to be heated if the collector temperature fails to reach the required value.

System configuration 5
Dual-circuit system with two collector arrays and two solar circuit pumps
(for layout, see page 21)

Subject to the temperature differential, the solar cylinder can be heated via collector array 1 or 2. For this, solar circuit pump 1 or 2 are started. If the collector temperature of both collector arrays is adequate for cylinder heating, both solar circuit pumps will start.

System configuration 6
Dual-circuit system with two collector arrays and one solar circuit pump
(for layout, see page 22)

This functions like system configuration 5, i.e. heating is achieved via collector array 1 or 2 via motorised valves that are opened accordingly. When the cylinder is heated the solar circuit pump is always switched as well.

Note: When installing motorised valves (el. V1 and el.V2) ensure an adequate clearance between the collector and the valve.
Otherwise the heat transfer can result in excessive thermal stresses on the valves that may lead to their failure.

System configuration 7
Dual-circuit system with two collector arrays, two solar cylinders with cylinder priority control and two solar circuit pumps
(for layout, see page 23)

Both cylinders are heated via priority control, as for system configuration 4. Heating takes place via collector array 1 or 2, depending on the prevailing temperature differential. If the collector temperature of both collector arrays is adequate for cylinder heating, both arrays will be used for heating, i.e. both solar circuit pumps will start (as for system configuration 5).

System configuration 8
Dual-circuit system with two collector arrays, two solar cylinders with cylinder priority control and one solar circuit pump
(for layout, see page 24)

This functions like system configuration 7, whereby heating is achieved via collector array 1 or 2 via motorised valves that are opened accordingly. When the cylinder is heated the solar circuit pump is always switched as well.

Note: When installing motorised valves (V1 and V2) ensure an adequate clearance between the collector and the valve.
Otherwise the heat transfer can result in excessive thermal stresses on the valves that may lead to their failure.

System configuration 9
Single circuit system with bypass circuit
(for layout, see page 25)

The bypass circuit is used in systems with higher output losses (e.g. because of longer lines). For this the system will initially be operated in bypass mode when the selected temperature differential between collector and solar cylinder is exceeded. Only when the temperature captured by the bypass sensor is adequate for heating the solar cylinder, the three-way diverter valve changes over to cylinder heating.
Cylinder heating stops when the bypass temperature is inadequate for heating or the temperature differential between the collector and solar cylinder falls by 5 K below the selected value.

System configuration 10
Dual-circuit system with two solar cylinders with cylinder priority control and bypass circuit
(for layout, see page 26)

As with system configuration 9, here too the system will initially be operated in bypass mode when the selected temperature differential between collector and solar cylinder is exceeded. For this, the temperature in the cylinder with priority is decisive.
When the temperature captured by the bypass sensor is adequate for heating the cylinder with priority, the three-way diverter valve changes over and that cylinder is then heated. The system changes over to the next lower ranking cylinder and changes back to the cylinder with priority as with system configuration 4.
Cylinder heating stops when the bypass temperature is inadequate for heating one of the two cylinders, or the temperature differential between the collector and cylinder falls by 5 K below the selected value.

System configuration 11
Dual-circuit system with two solar cylinders in parallel cylinder mode with bypass circuit
(for layout, see page 27)

As with system configuration 9, here too the system will initially be operated in bypass operation when the selected temperature differential between collector and solar cylinder is exceeded. For this, the temperature in the cylinder with priority is decisive.
When the temperature captured by the bypass sensor is adequate for heating the cylinder with priority, the three-way diverter valve changes over and that cylinder is then heated.
The lower ranking cylinder will be heated in parallel to the cylinder with priority when the selected temperature differential for parallel cylinder operation has been exceeded (as for system configuration 3).
With this system configuration the differential temperature between bypass and cylinder with priority is decisive.

Output connection (230 V)

Solar circuit pump SKP1
This is where the solar circuit pump (systems with solar circuit pump) or solar circuit pump 1 (systems with two solar circuit pumps) are connected.

Output A1
Output A1 is assigned differently, subject to the selected system configuration:
Configuration 3, 5, 7: Solar circuit pump 2
Configuration 2, 4, 6, 8, 11: Motorised valve 1
Configuration 9, 10: Three-way diverter valve 1
The output is not assigned with configuration 1.

Output A2
Output A2 is assigned differently, subject to the selected system configuration:
Configuration 6, 8, 11: Motorised valve 2
Configuration 7: Three-way diverter valve 1
Configuration 10: Three-way diverter valve 2
The output is not assigned with configurations 1, 2, 3, 4, 5, 9.

Output A3
Output A3 is assigned differently, subject to the selected system configuration:
Configuration 2, 3, 4, 5, 6, 7, 9, 10: DHW circulation pump (option)
Configuration 8,11: Three-way diverter valve 1
The output is not assigned with configuration 1.

Output A4
Various functions can be assigned to output A4.
a) to switch a de-stratification pump to circulate water inside a cylinder as part of pasteurisation
b) as thermostat function: The output will be switched if the selected cylinder temperature is exceeded. This output can be used, for example, to enable cylinder reheating.

Input connection

Solar sensor cylinder SFS1 (NTC)
This is where the cylinder sensor (systems with solar cylinder) or cylinder sensor 1 (systems with two solar cylinders) are connected.

Solar sensor collector SFK1 (PT1000)
This is where the collector sensor (systems with one collector array) or collector sensor of collector array 1 (systems with two collector arrays) are connected.

Input E1
Input E1 is assigned differently, subject to the selected system configuration:
Configuration 7, 8, 10, 11: Cylinder sensor cylinder 2 (NTC)
Configuration 2: Return sensor (required) (NTC)
Configuration 1, 3, 4, 5, 6: Return sensor (required if yield calculation has been enabled) (NTC)
The input is not assigned with configuration 9.

Input E2

For enabled yield calculation with actually measured flow rate (possible with configurations 1, 3, 4, 5, 6), the flow rate generator is connected to input E2. This is part of the heat meter set (accessories).

Input E3

Input E3 is assigned differently, subject to the selected system configuration:
Configuration 3, 4: Cylinder sensor solar cylinder 2 (NTC)
Configuration 5, 6, 7, 8: Collector sensor collector array 2 (PT1000)
Configuration 2: Buffer sensor (NTC)
Configuration 9, 10, 11: Bypass sensor (NTC)
The input is not assigned with configuration 1.

eBUS

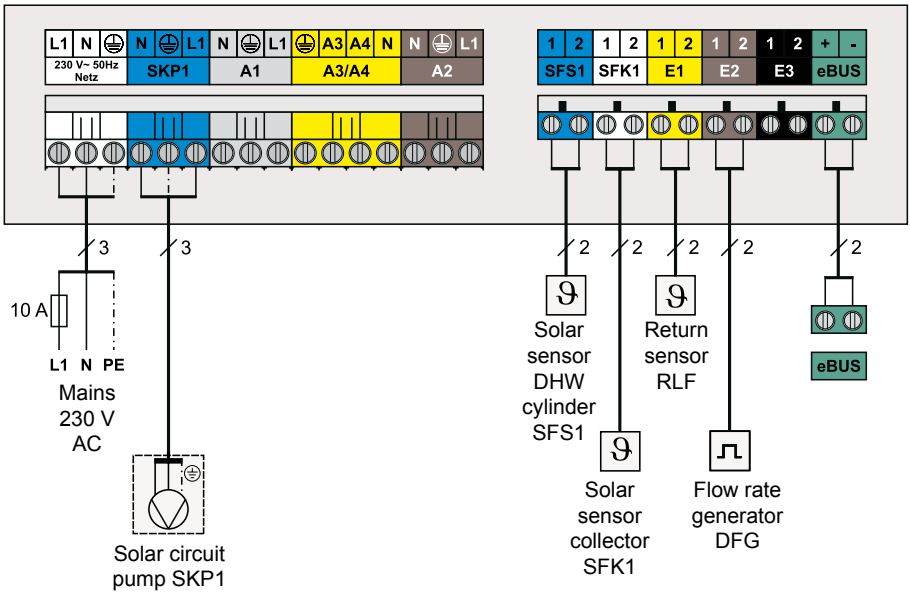
When using the solar module SM2 as part of a Wolf control system, the individual components are linked together via eBUS.

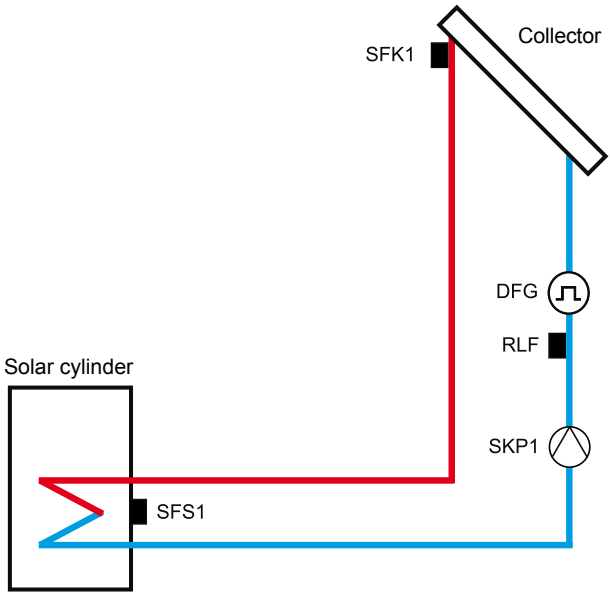
Recommended cables/ leads and their minimum cross-sections:

H005VV	3x1.0 mm²	Power cable
H05VV	3x0.75mm²	Solar circuit pump, three-way diverter valve, motorised valve, DHW circulation pump, de-stratification/transfer pump
H05VV	2x0.5mm²	BUS cable
H05VV	2x0.5mm²	Sensor leads up to 15 m
H05VV	2x0.75mm²	Sensor leads up to 50 m

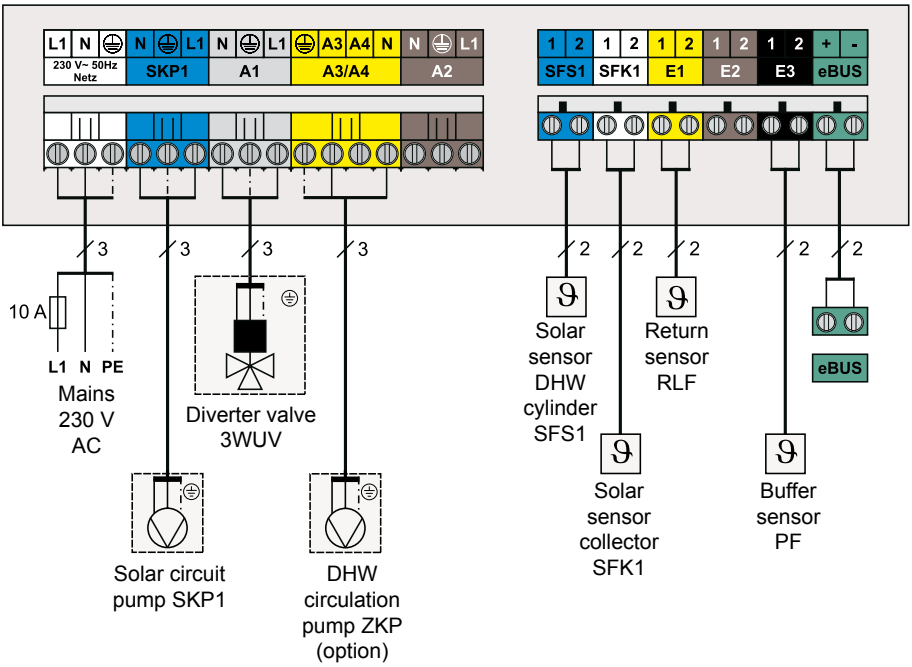
During service work, isolate the entire system from the power supply, otherwise there will be a risk of electrocution.

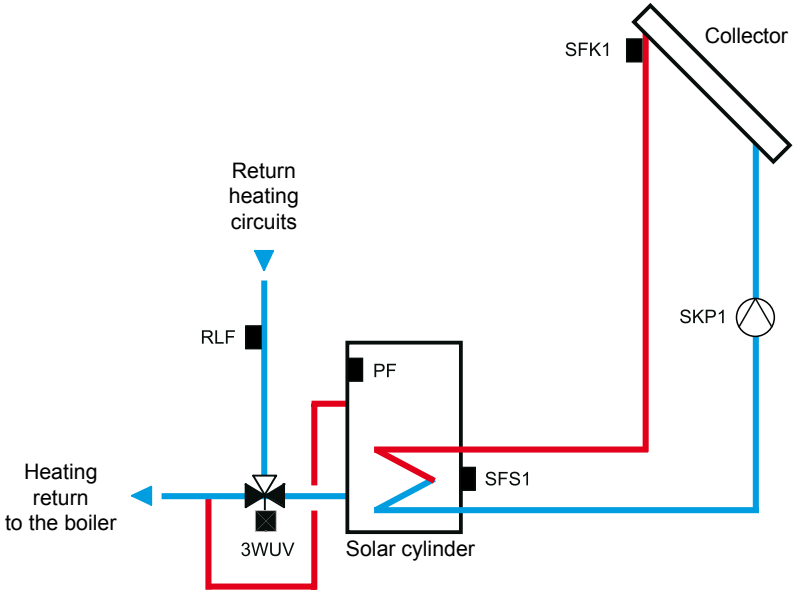
System configuration 1: **Single circuit system**



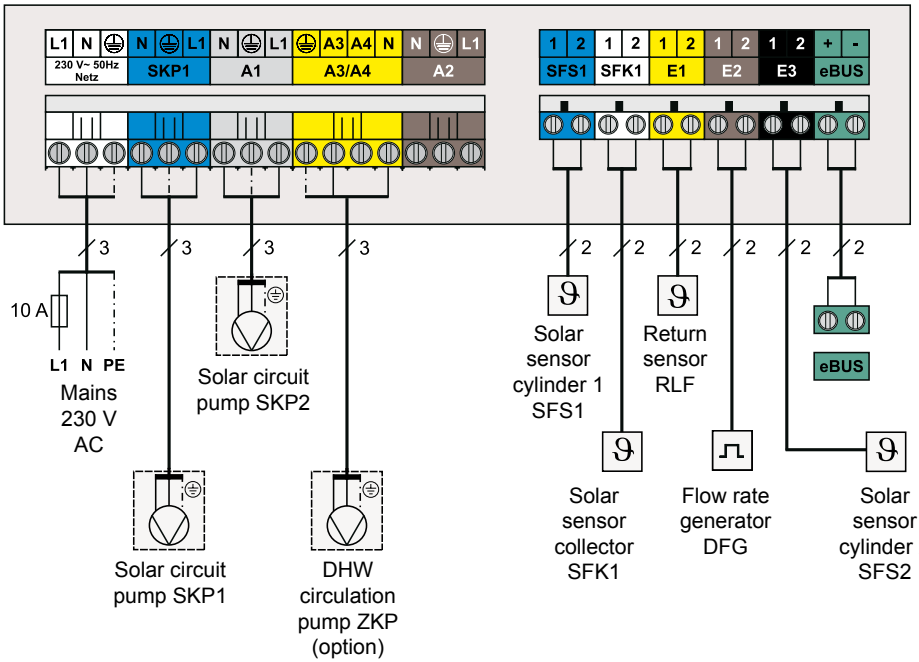


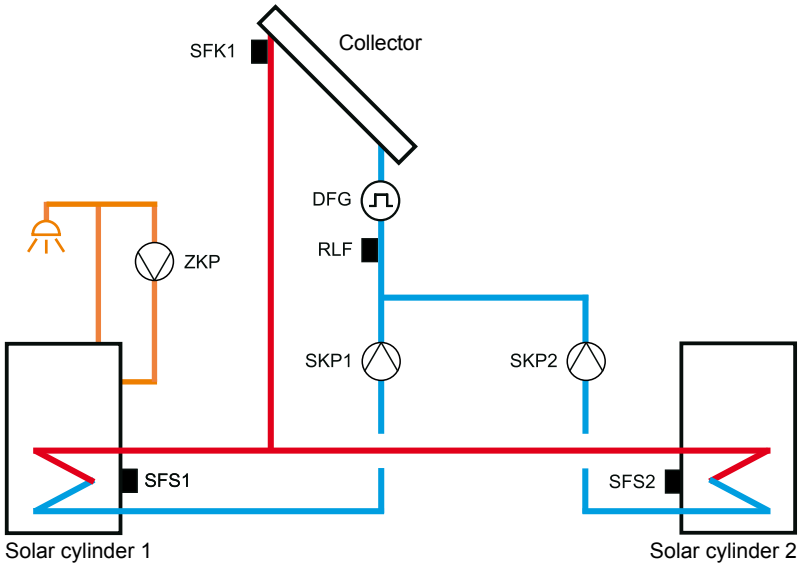
System configuration 2: **Single circuit system with return temperature raising for central heating backup**



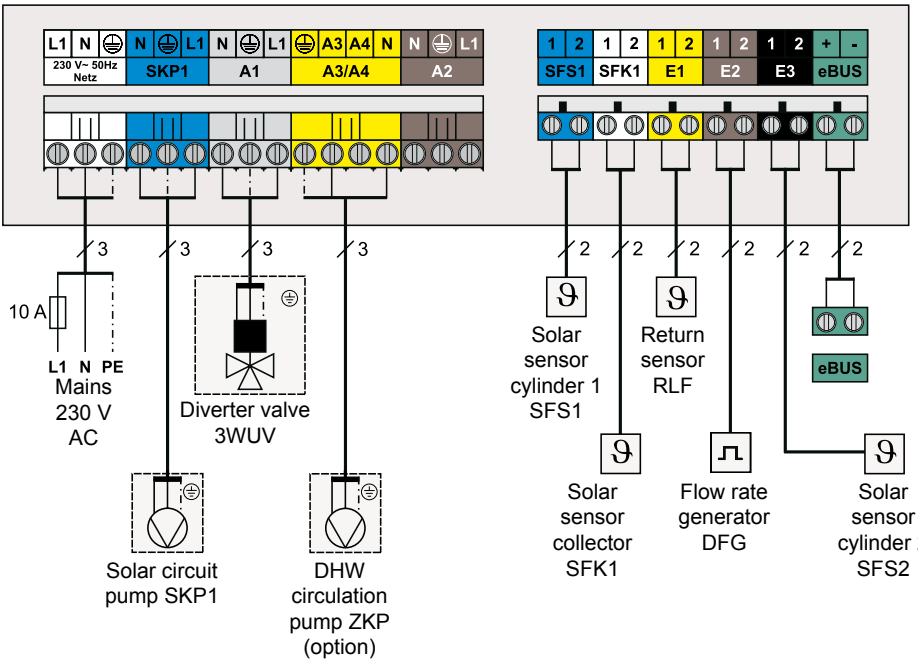


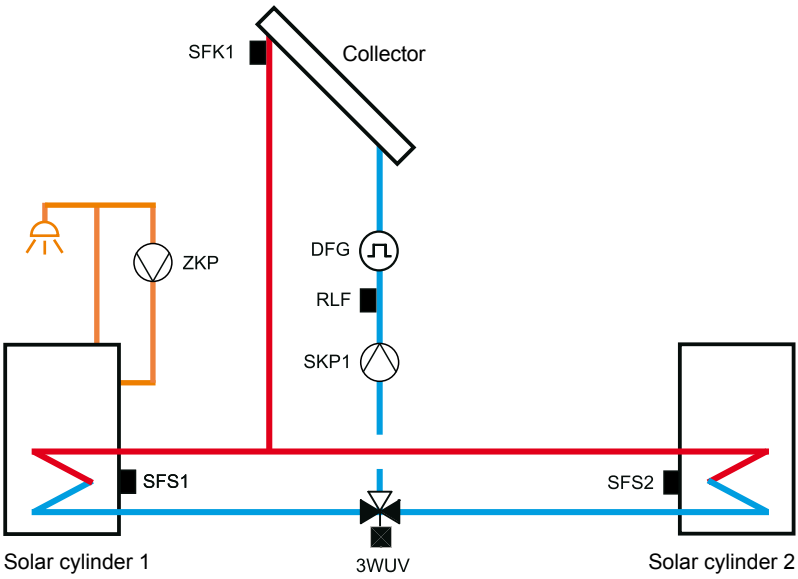
System configuration 3: **Dual-circuit system with two solar cylinders in parallel operation**



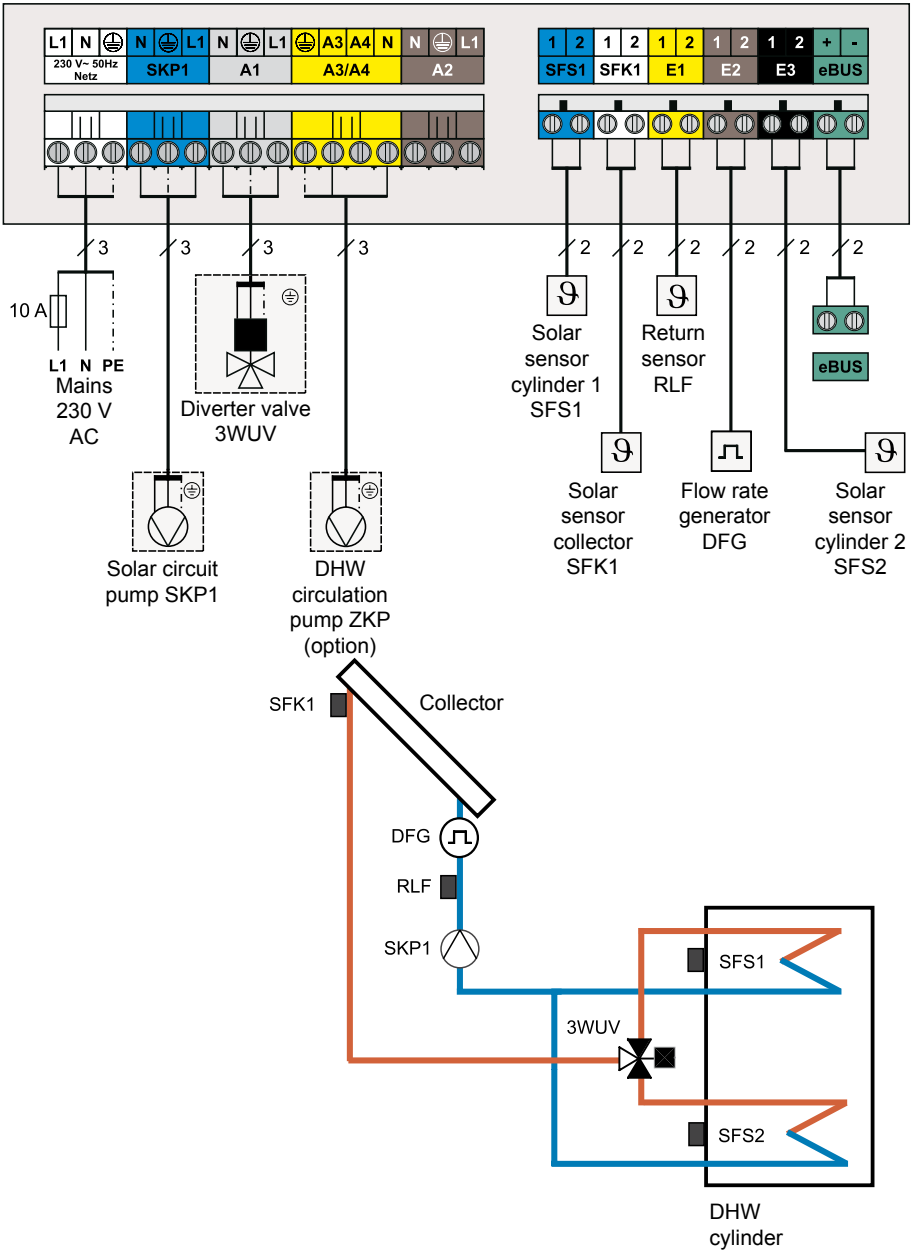


System configuration 4.0: **Dual-circuit system with two solar cylinders with cylinder priority control**

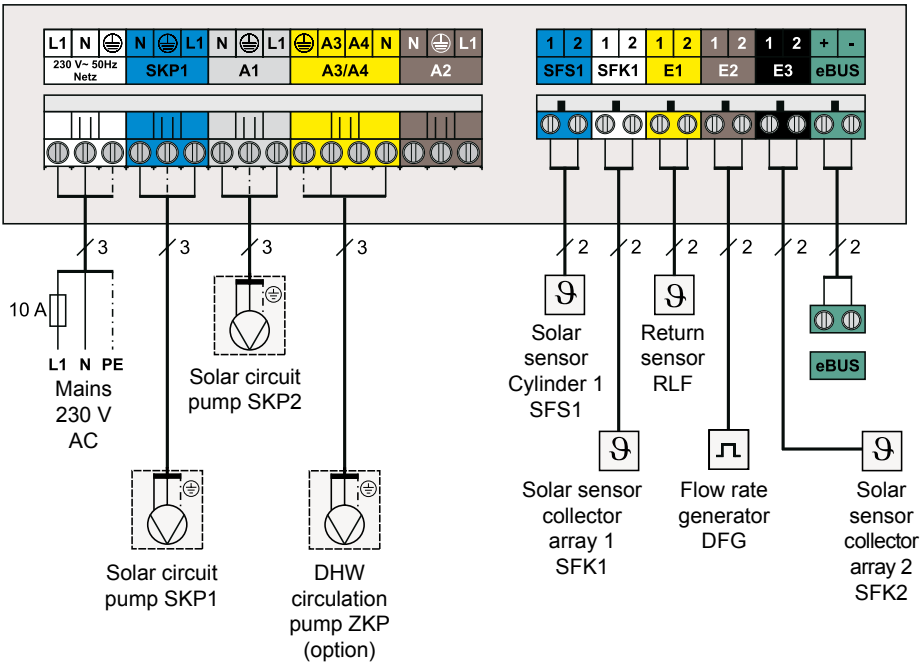


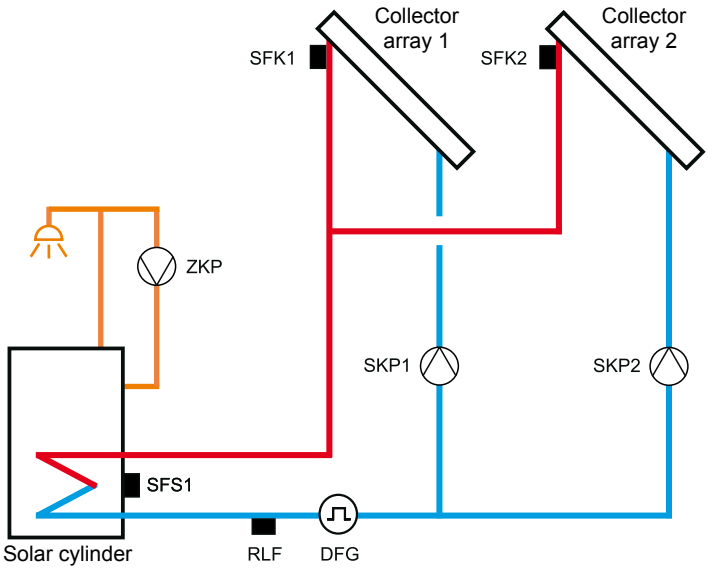


System configuration 4.1: **Single circuit system with two internal indirect solar coils inside the cylinder**

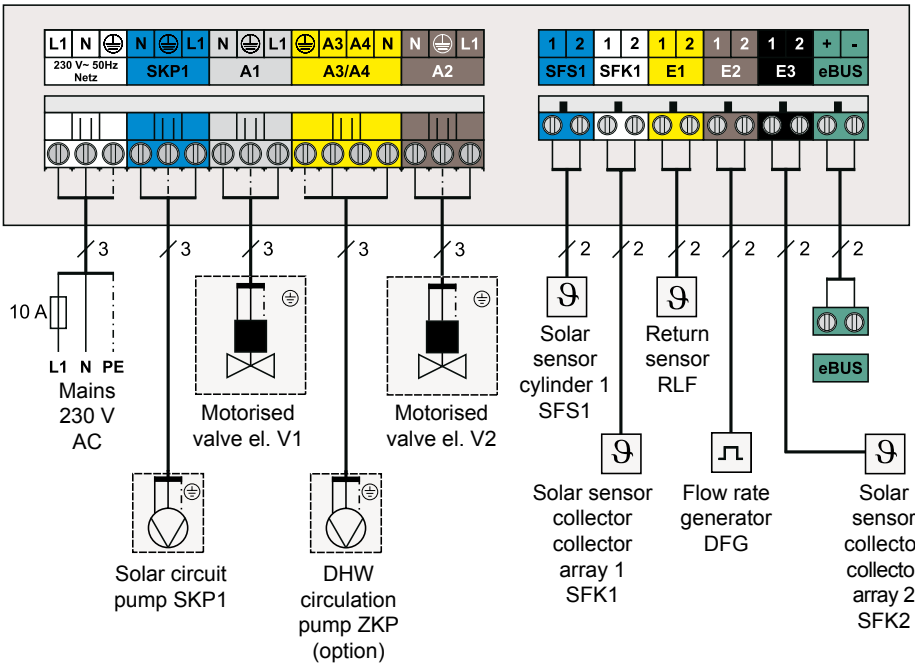


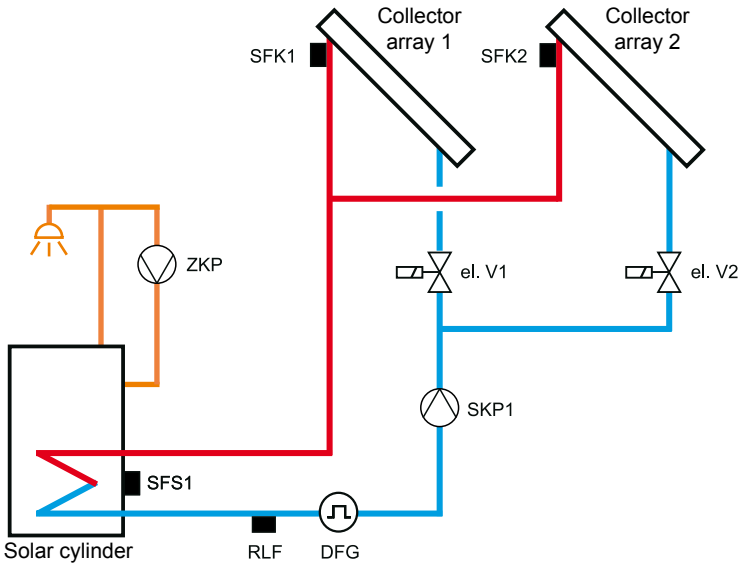
System configuration 5: **Dual-circuit system with two collector arrays and two solar circuit pumps**



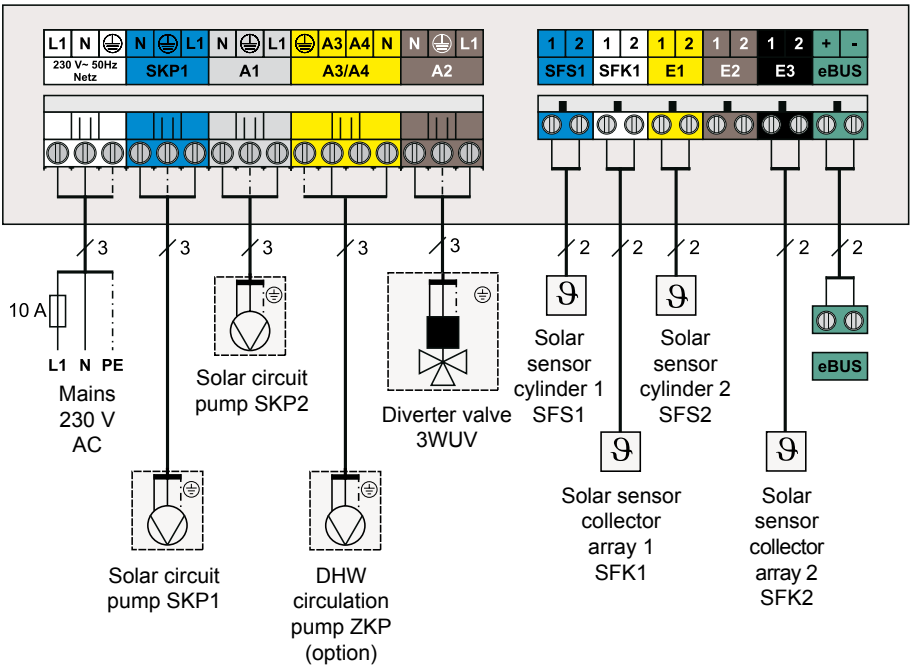


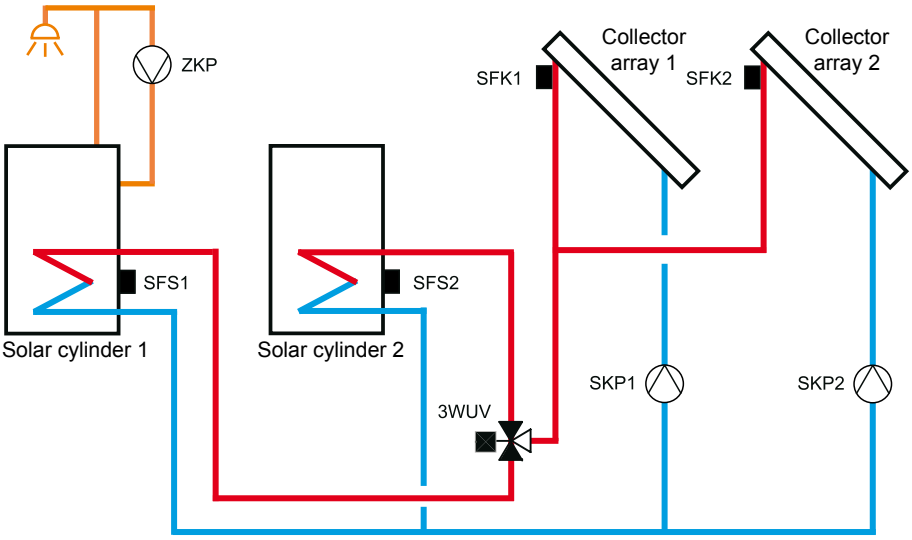
System configuration 6: **Dual-circuit system with two collector arrays and one solar circuit pump**



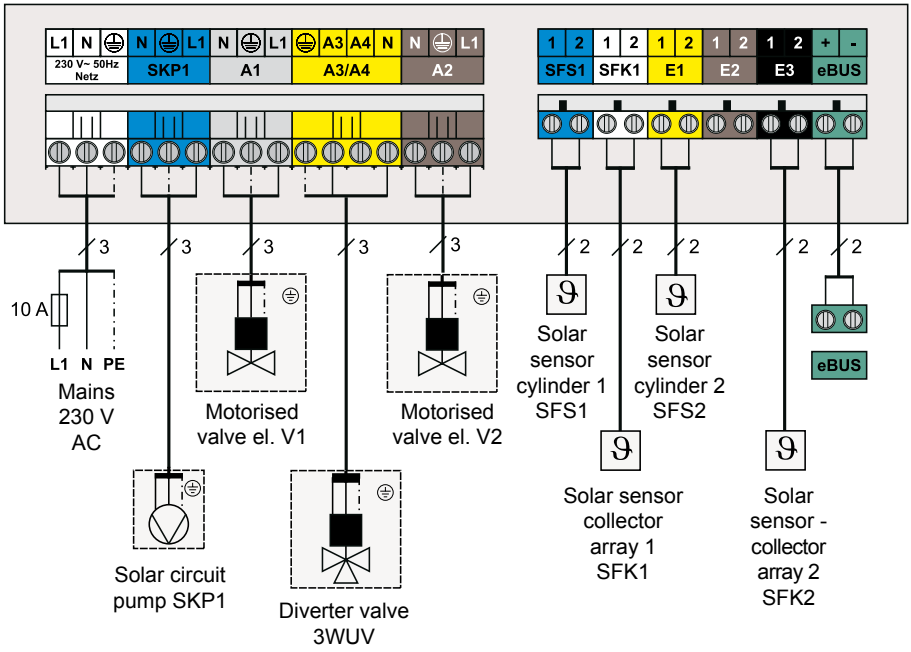


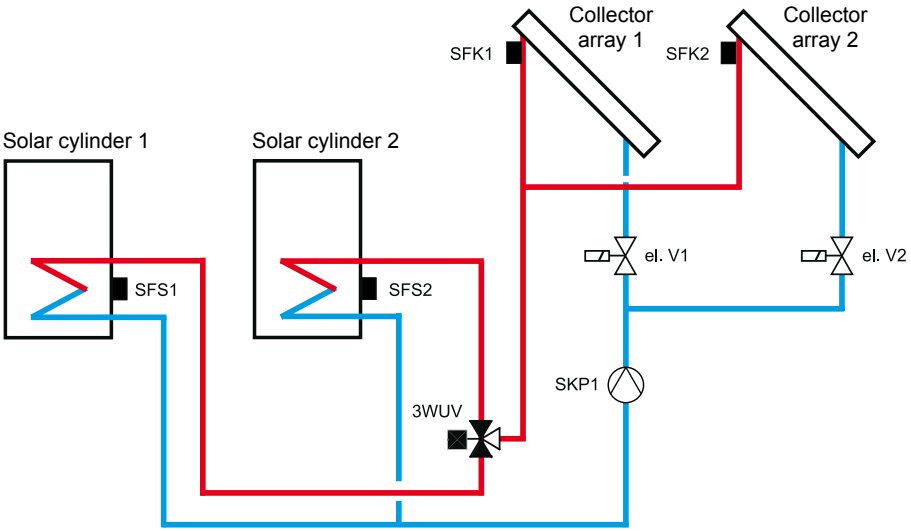
System configuration 7: **Dual-circuit system with two collector arrays, two solar cylinders with cylinder priority control and two solar circuit pumps**



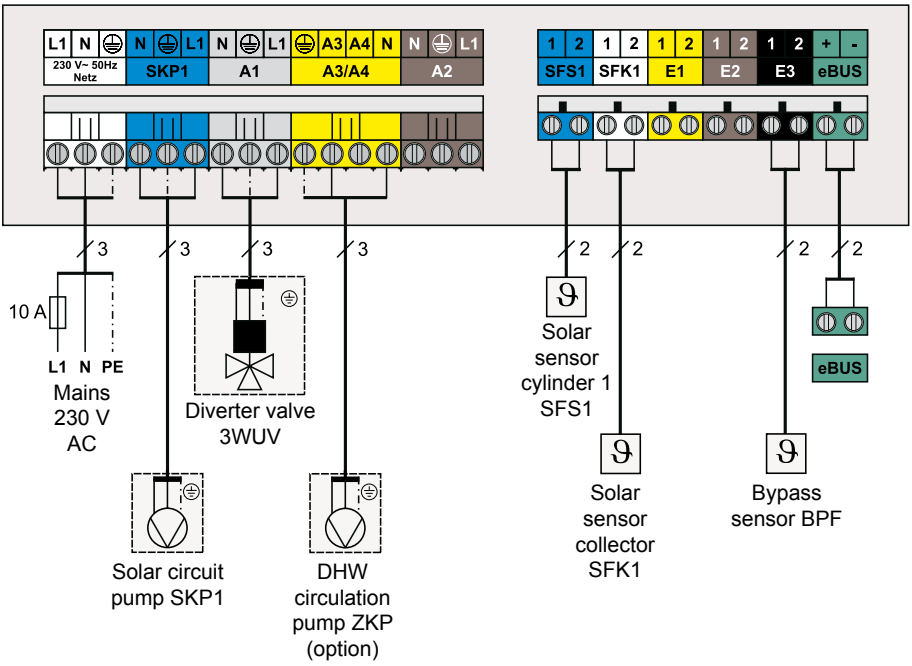


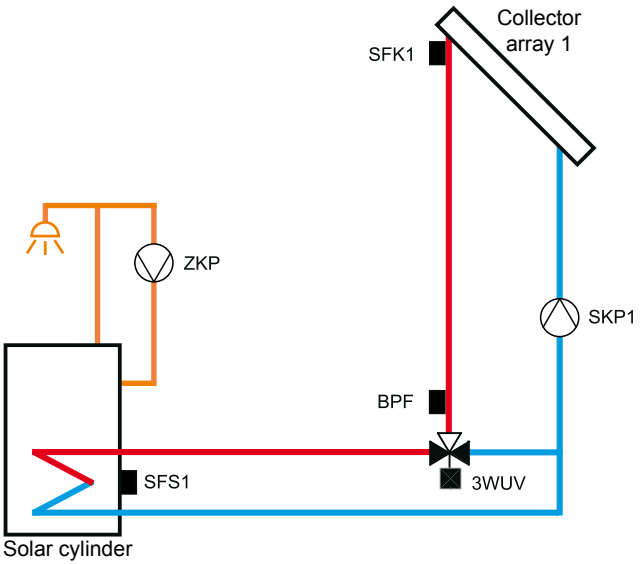
System configuration 8: **Dual-circuit system with two collector arrays, two solar cylinders with cylinder priority control and one solar circuit pump**



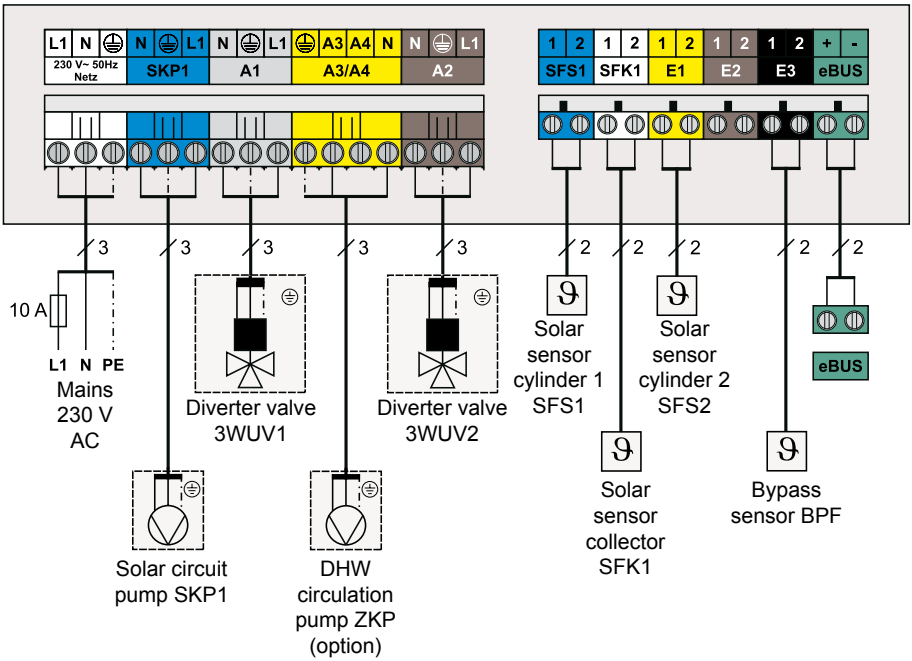


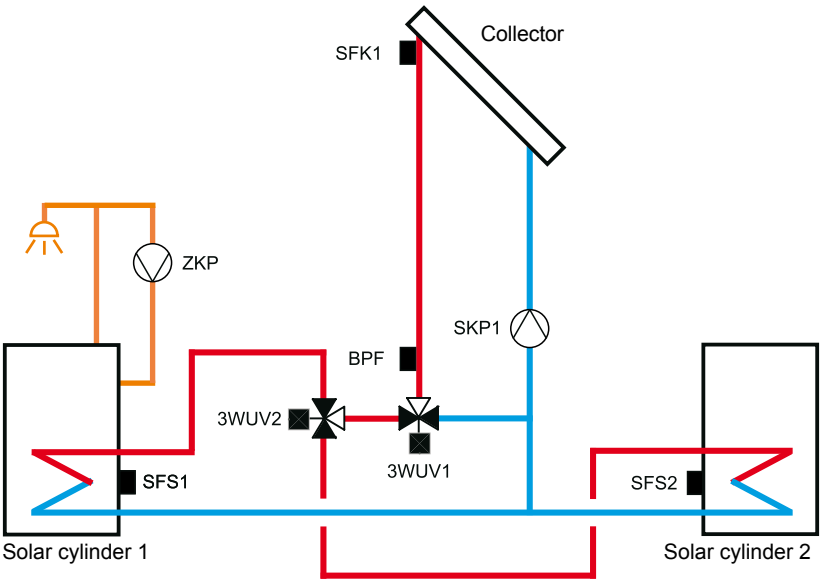
System configuration 9: **Single circuit system, bypass circuit**



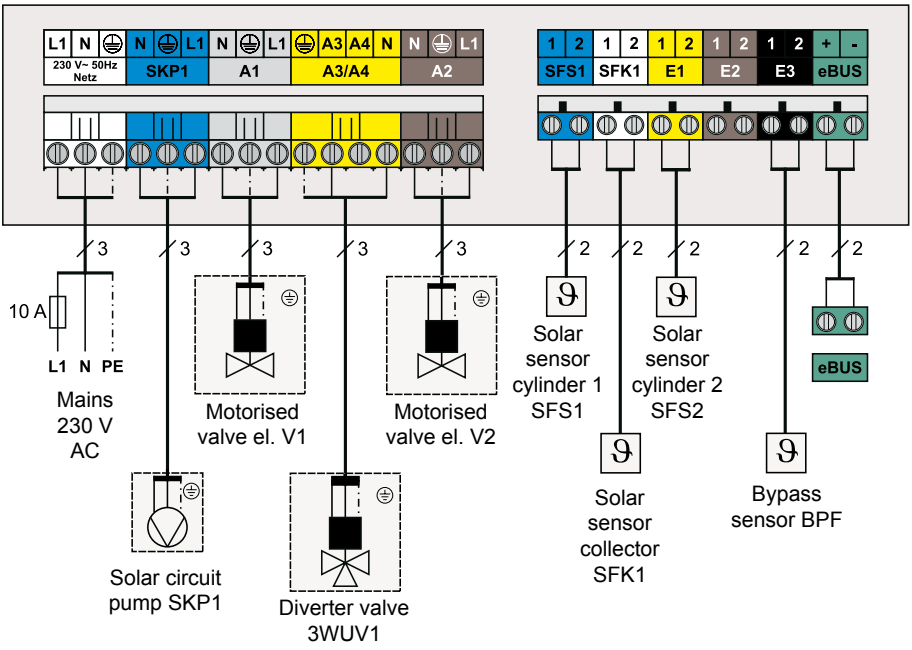


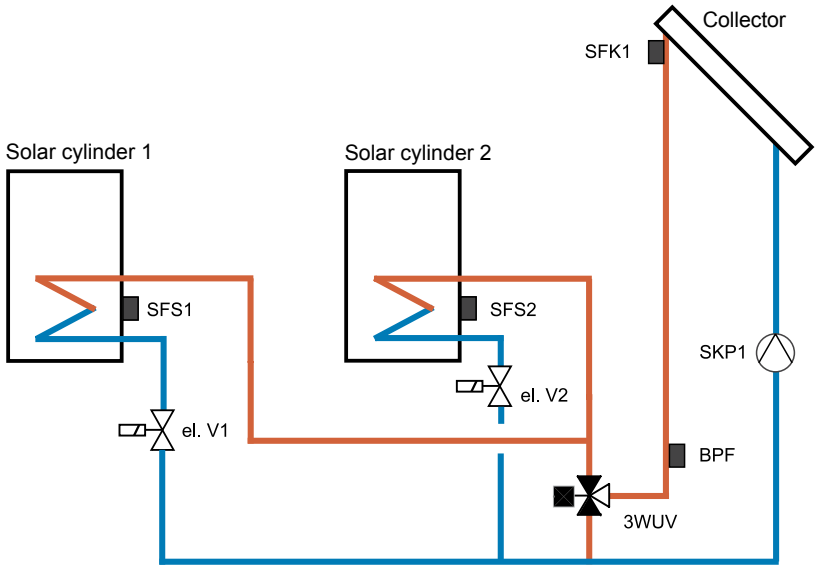
System configuration 10: **Dual-circuit system with two solar cylinders with cylinder priority control and bypass circuit**





System configuration 11: **Dual-circuit system with two solar cylinders with parallel cylinder operation and bypass circuit**





Parameter list

All parameters can be adjusted via the programming module BM or BM-Solar.

With the BM, access is provided via control level 2 at the menu level "Contractor → Solar" (see BM operating instructions).

With the BM-Solar, turning the rotary selector enables the parameter level to be changed (see BM-Solar operating instructions).

Parameters BM	Parameters BM-Solar	Explanation	Setting range		Factory setting
			min.	max.	
SOL 01	P 01	Start differential solar cylinder 1	8 K	30 K	10 K
SOL 02	P 02	Stop differential solar cylinder 1	3 K	20 K	5 K
SOL 03	P 03	Collector protection function	0 (OFF)	1 (ON)	0
SOL 04	P 04	Critical collector temperature	90 °C	150 °C	110 °C
SOL 05	P 05	Maximum collector temperature	100 °C	150 °C	130 °C
SOL 06	P 06	Max. temperature, solar cylinder 1	15 °C	90 °C	60 °C
SOL 07	P 07	Assignment, solar cylinder 1	0	8	0
SOL 08	P 08	Capturing the heat volume	0 (OFF)	2	0
SOL 09	P 09	Pulse generator Flow rate, solar circuit	0 l/pulse 0 l/min.	99.5 l/pulse 99.5 l/min.	1 l/pulse 1 l/min.
SOL 10	P 10	Medium selection	0	1	-
SOL 11	P 11	BUS feed	0 (OFF)	2 (Auto)	-
SOL 12	P 12	Configuration	1	11	1
SOL 13	P 13	Speed control, solar circuit pump	0 (NO)	1 (YES)	0
SOL 14	P 14	Start differential solar cylinder 2	8 K	30 K	10 K
SOL 15	P 15	Stop differential solar cylinder 2	3 K	20 K	5 K
SOL 16	P 16	Max. temperature, solar cylinder 2	15 °C	90 °C	60 °C
SOL 17	P 17	Assignment, solar cylinder 2	0	8	8
SOL 18	P 18	Burner blocked during return temp. raising	0 s	300 s	0 s
SOL 19	P 19	Start differential, return temp. raising	8 K	30 K	10 K
SOL 20	P 20	Stop differential, return temp. raising	3 K	20 K	5 K
SOL 21	P 21	Priority cylinder	0 (cyl.1)	1 (cyl.2)	0
SOL 22	P 22	Start differential, parallel cylinder op.	20 K	60 K	30 K
SOL 23	P 23	Differential temp. bypass operation	30 K	100 K	15 K
SOL 24	P 24	Function output A4	0 (OFF)	2	0
SOL 25	P 25	Start temp., thermostat function	30 °C	90 °C	50 °C
SOL 26	P 26	Stop differential, thermostat function	5 K	30 K	10 K
SOL 27	P 27	Tube collector function	0 (OFF)	2	0
SOL 28	P 28	Frost protection	0 (OFF)	1 (ON)	0
SOL 50	P 50	Relay test	1	5	1
SOL 70		Analogue input SFS 1			
SOL 71		Analogue input SFK 1			
SOL 72		Analogue input E 1			
SOL 73		Analogue input E 2 (DFG)			
SOL 74		Analogue input E 3			

*SOL70 - SOL 74

At the BM contractor level, the current values of the sensors connected to the inputs are also displayed. Assignment of inputs E1 and E3 subject to system configuration.

Introduction

The following applies to systems with only one cylinder:
Solar cylinder = solar cylinder 1

SOL01 / P01
Start differential Solar cylinder 1

The SM2 captures the temperature at the collector and at the lower section of cylinder 1 at the level of the internal indirect solar coil. The heating of solar cylinder 1 is enabled when the collector temperature exceeds the cylinder temperature by the selected start differential:

Collector temperature >= Cylinder temperature solar cylinder 1 + Start differential solar cylinder 1 -> Cylinder heating

Systems with bypass circuit:
In systems with bypass circuit the cylinder temperature is compared with the bypass temperature:

Bypass temperature >= Cylinder temperature solar cylinder 1 + Start differential solar cylinder 1 -> Cylinder heating

The start differential is always held at least 5 K above the stop differential (start differential >= stop differential + 5 K), even if a lower value has been entered to safeguard a reliable operation.

SOL02 / P02
Stop differential Solar cylinder 1

Cylinder heating stops when the collector temperature falls below the total of cylinder temperature solar cylinder 1 and stop differential solar cylinder 1.

Collector temperature < Cylinder temperature solar cylinder 1 + Stop differential solar cylinder 1 -> Cylinder heating OFF

Systems with bypass circuit:
In systems with bypass circuit the cylinder temperature is compared with the bypass temperature:

Collector temperature < Cylinder temperature solar cylinder 1 + Stop differential solar cylinder 1 -> Cylinder heating OFF

SOL03 / P03
Collector protection function

The collector protection function and reverse cooling are active if parameter 3 is set to 1.

SOL04 / P04
Critical collector temperature

Collector protection function:
As soon as the collector temperature exceeds the critical collector temperature, the collector or the respective collector array (for systems with two collector arrays) receives a flow of medium. Subject to system configuration the respective outputs that are required to provide the flow are switched. The flow is stopped again when the collector temperature = critical collector temperature - 20 K.

NB:
The collector protection function raises the corresponding cylinder to temperatures above a selected maximum cylinder temperature (max. 95 °C).
Always ensure that cold water is mixed in with hot water if the collector protection function is active (risk of scalding).

Reverse cooling:
The reverse cooling function reduces the cylinder temperature that has been raised through the collector protection function via the cooled-down collector back to the selected maximum cylinder temperature.
Collector temperature < cylinder temperature – 15 K -> activation reverse cooling function

SOL05 / P05
Maximum collector temperature

When the maximum collector temperature is exceeded, the flow through the collector or the respective collector array (in systems with two collector arrays) is switched off to protect the system. For this, the solar circuit pump is switched off or the respective motorised valve is closed.
Any enabled collector protection is then no longer functional.
The flow will be enabled again when the collector temperature of the respective collector array falls 10 K below the maximum collector temperature. Any enabled collector protection is then effective again.

SOL06 / P06
Maximum cylinder temperature Solar cylinder 1

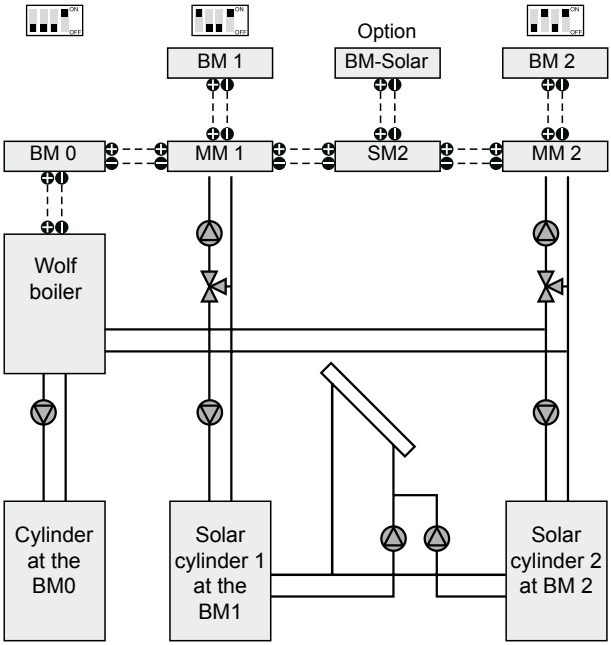
The water inside solar cylinder 1 is heated up to the maximum cylinder temperature. Cylinder heating is terminated, if
Cylinder temperature solar cylinder 1 > Maximum cylinder temperature solar cylinder 1.

SOL07 / P07
Assigning solar cylinder 1
SOL17 / P17
Assigning solar cylinder 2

This parameter is relevant when using the solar module as part of a Wolf control system.
The overall system can include up to eight cylinders and several BM programming modules. In conjunction with the solar module SM2, up to two cylinders can be used as solar cylinders.
One BM programming module must be assigned to each solar cylinder to safeguard the functions "Blocking cylinder reheating" or "Blocking pasteurisation" (see description of auxiliary functions).
The assignment of solar cylinder 1 is determined in parameter 07, the assignment of solar cylinder 2 in parameter 17:

Setting parameters	Allocation
0	The solar cylinder is allocated to BM 0
1	The solar cylinder is allocated to BM 1
2	The solar cylinder is allocated to BM 2
3	The solar cylinder is allocated to BM 3
4	The solar cylinder is allocated to BM 4
5	The solar cylinder is allocated to BM 5
6	The solar cylinder is allocated to BM 6
7	The solar cylinder is allocated to BM 7
8	No allocation

Cylinder assignment example:



Note: MM = mixer module

In this example, solar cylinder 1 is assigned to the programming module with address 1 (BM1, and solar cylinder 2 to the programming module with address 2 (BM2). This requires the following setting:

SOL07 / P07 = 1
SOL17 / P17 = 2

The setting can be made via the BM with address 0 (BM0) or via the BM-Solar.

Then the solar module can also be operated from the assigned programming modules.

SOL08 / P08
Heat amount capture

System configurations 1, 3, 4, 5, 6 enable the capture of the amount of heat yielded by the solar thermal system (solar yield).
For this, parameter 08 enables the choice whether yield is determined by means of the actual or a specified flow rate:

SOL08 / P08 = 0: Heat amount capture disabled
SOL08 / P08 = 1: Yield capture with actual flow rate
SOL08 / P08 = 2: Yield determination with a specified flow rate

Yield determination with the actual flow rate:
The yield determination with the actual flow rate is carried out via collector sensor, flow rate transducer and return sensor. This constantly calculates the yield and the output using the actually captured flow rate. This requires the heat meter set (part no. 2744392).

Yield determination with a specified flow rate:
To determine the yield using a specific flow rate, that flow rate must be captured and entered at least once. The yield is then calculated using that specified value, the collector sensor and the return sensor (part no. 2792022). Install the return sensor near the pump-valve assembly.

Note:
For variable flow rates (e.g. active speed control), determining the yield is only sensible with the actually captured flow rate.

SOL09 / P09
Flow rate

To determine the yield, enter the calculated flow rate or the pulse value of the flow rate generator used here.
The entry is subject to the settings of parameter 08:

SOL08 / P08 = 1:
Enter the pulse value of the flow rate generator used in l/pulse (flow rate per pulse). As factory-setting, a value for the heat meter set of 1 l/min has been pre-selected.

SOL08 / P08 = 2:
Enter the determined flow rate in l/min.

SOL10 / P10
Medium selection

With this parameter select, whether the medium used is water or the Wolf-specific heat transfer medium.

SOL10 / P10 = 0: Medium = Water
SOL10 / P10 = 1: Medium = Heat transfer medium specified by Wolf

SOL11 / P11
BUS feed

A BUS feed is integrated into solar module SM2, to supply other BUS subscribers, for example a programming module. You can program the respective function.

SOL11 / P11 = 0: BUS feed switched OFF
SOL11 / P11 = 1: BUS feed permanently ON
SOL11 / P11 = 2: BUS feed is switched ON or OFF automatically

SOL12 / P12
System configuration

The corresponding system configuration may, subject to the application of the SM2 solar module, have to be selected.
Eleven system versions with up to two solar cylinders and two collector arrays are available:

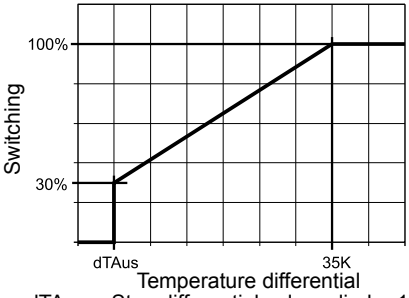
Setting parameters	System
1	Single circuit system
2 *	Single circuit system with return temperature raising for central heating backup
3	Dual-circuit system with two solar cylinders in parallel operation
4	Dual-circuit system with two solar cylinders with cylinder priority control
5	Dual-circuit system with two collector arrays and two solar circuit pumps
6	Dual-circuit system with two collector arrays and one solar circuit pump
7	Dual-circuit system with two collector arrays, two solar cylinders with cylinder priority control and two solar circuit pumps
8	Dual-circuit system with two collector arrays, two solar cylinders with cylinder priority control and one solar circuit pump
9	Single circuit system with bypass circuit
10	Dual-circuit system with two solar cylinders with cylinder priority control and bypass circuit
11	Dual-circuit system with two solar cylinders with parallel cylinder operation and bypass circuit

The schematic layout of the various systems is illustrated with a description of the electrical connections relative to the individual system configurations (chapter "Electrical connection").

* When using the SM2 with connection set CGS / CGW / CGI (part no. 27 44 465), select system configuration 2.

SOL13 / P13
Variable speed pump control

With system configurations 1, 2, 4, 6, 8, 9, 10, 11, the solar circuit pump can be operated with variable speed control.
SOL13 / P13 = 1 → variable speed control enabled
SOL13 / P13 = 0 → variable speed control disabled (factory setting)
Once variable speed control has been enabled, first implement a new start (power "OFF"/power "ON")
With variable speed control, the speed and consequently the pump rate of the solar circuit pump is matched to any lowering of the temperature differential between the collector and the cylinder temperature. For this, the speed is progressively reduced from a temperature differential of 35 K down to the selected stop differential.



dTAus = Stop differential solar cylinder 1

NB

Note:
In connection with "High efficiency pumps",
never change the factory setting of parameter SOL13.

SOL14 / P14
Start differential solar cylinder 2

In systems with two cylinders, the start differential for solar cylinder 2 is selected here.
The function is similar to that of parameter SOL01 / P01 (start differential solar cylinder 1):

Collector temperature >= Cylinder temperature solar cylinder 2 + Start differential solar cylinder 2 -> Cylinder heating

Systems with bypass circuit:
Bypass temperature >= Cylinder temperature solar cylinder 2 + Start differential solar cylinder 2 -> Cylinder heating

The start differential is always held at least 5 K above the stop differential (start differential >= stop differential + 5 K), even if a lower value has been entered to safeguard a reliable function.

SOL15 / P15
Stop differential solar cylinder 2

In systems with two cylinders, the stop differential for solar cylinder 2 is selected here.
The function is similar to that of parameter SOL02 / P02 (stop differential solar cylinder 1):

Collector temperature < Cylinder temperature solar cylinder 2 + Stop differential solar cylinder 2 -> Cylinder heating OFF

Systems with bypass circuit:
Collector temperature < Cylinder temperature solar cylinder 2 + Stop differential solar cylinder 2 -> Cylinder heating OFF

SOL16 / P16
Maximum cylinder temperature, solar cylinder 2

In systems with two cylinders, the maximum temperature for solar cylinder 2 is selected here.
The function is similar to that of parameter SOL06 / P06 (maximum cylinder temperature solar cylinder 1):

The water inside solar cylinder 2 is heated up to the maximum cylinder temperature. Cylinder heating is terminated, if
Cylinder temperature solar cylinder 2 > Maximum cylinder temperature solar cylinder 2

SOL17 / P17
Assigning solar cylinder 2

For a description, see parameter SOL07 / P07 (assignment, solar cylinder 1)

SOL18 / P18
Burner blocking in case of return temperature raising

For raising the return temperature during central heating backup, a three-way diverter valve is controlled to raise the heating return temperature via a buffer cylinder that has previously been heated up.
When the SM2 is operated as part of the Wolf control system WRS, the boilers are blocked when the start conditions have been met.
If a demand is issued by at least one heating circuit or one DHW cylinder, the three-way diverter valve will be switched, and the blocking time set in parameter SOL 18 (= blocking time for burner blocking) starts. The burner will be enabled again after the blocking time has expired. The burner will be disabled for the set time when the start condition has been met whilst the burner is already enabled.

When setting a blocking time of 0 s, the three-way diverter valve will be switched independent of a heat demand.

SOL19 / P19
Start differential, return temperature raising

This parameter is only relevant to systems with return temperature raising for central heating backup (system configuration SOL12 / P12 = 2).
Here, the central heating return is raised via a buffer cylinder that is heated by the solar thermal system. If the condition
Buffer temperature > Return temperature + Start differential, return temperature raising has been met, then the three-way diverter valve is switched.

SOL20 / P20
Stop differential Return temperature raising

This parameter is only relevant to systems with return temperature raising for central heating backup (system configuration SOL12 / P12 = 2).
Return temperature raising is terminated, if
Buffer temperature < Return temperature + Stop differential, return temperature raising

SOL21 / P21
Cylinder with priority

In systems with two solar cylinders, one cylinder is defined as having priority, the other as lower ranking cylinder.
The assignment as cylinder with priority is determined in parameter 21.
SOL21 / P21= 0 → Cylinder with priority = cylinder 1 (factory setting)
SOL21 / P21= 1 → Cylinder with priority = cylinder 2

SOL22 / P22
Start differential, parallel cylinder operation

With system configurations 3 and 11, both solar cylinders are operated in parallel.
If during heating the cylinder with priority the temperature differential between the collector and the cylinder with priority exceeds the selected value, the lower ranking cylinder will be heated in parallel to the cylinder with priority.

Collector temperature > Cylinder temperature cylinder with priority + Start differential parallel cylinder operation -> Parallel cylinder operation

If the temperature differential falls again 5 K below the selected value, then parallel operation will terminate and only the cylinder with priority will continue to be heated:

Collector temperature > Cylinder temperature cylinder with priority + Start differential parallel cylinder operation -5 K -> Parallel cylinder operation terminates

SOL23 / P23
Differential temperature, bypass operation

With system configurations 9,10,11 a bypass circuit to compensate line losses is integrated. A three-way diverter valve switches over between bypass and cylinder heating. Initially, the solar circuit is operated in bypass mode. Only when the temperature captured by the bypass sensor is adequate for cylinder heating will the system change over to cylinder heating.
Bypass operation will commence when the temperature differential between collector temperature and solar cylinder exceeds the selected value:
Collector temperature > Cylinder temperature solar cylinder + SOL23 / P23

The three-way diverter valve changes to cylinder heating when the bypass temperature is adequate for heating the cylinder.

Bypass temperature >= Cylinder temperature solar cylinder + Start differential

SOL24 / P24
Function, output A4

The following functions can be allocated to output A4:

SOL24 / P24 = 0: no function
SOL24 / P24 = 1: Cylinder de-stratification
Pasteurisation mode
SOL24 / P24 = 2: Thermostat function

With SOL24 / P24 = 1 the pump connected to the boiler is switched to circulate the cylinder contents when pasteurisation is active.

With SOL24 / P24 = 2 output A4 is switched, if the cylinder temperature falls below the value selected in SOL25 / P25:
Cylinder temperature < SOL25 / P25 -> A4 enabled
This allows a cylinder reheating to be enabled.

The output will be disabled again at a cylinder temperature > SOL25 / P25 + SOL26 / P26.

In two-cylinder systems, this function is implemented with the priority cylinder.

SOL25 / P25
Start temperature, thermostat function

With the thermostat function enabled the value at which output A4 is enabled is selected here (see description SOL24 / P24).

SOL26 / P26
Stop differential, thermostat function

With the thermostat function enabled the value at which output A4 is disabled is selected here (see description SOL24 / P24).

SOL27 / P27
Tube collector function

To enable the correct collector temperature to be captured when tube collectors are idle, the medium flows through the collector array for a short time.

In parameter SOL27 / P27 the following settings are available for selection:

SOL27 / P27 = 0: Tube collector function disabled (factory setting)
SOL27 / P27 = 1: Tube collector function via temperature increase
SOL27 / P27 = 2: Tube collector function over time

Tube collector function via temperature increase:
When the actual collector temperature increases by 2 K, medium will be pumped through the collector array for 30 s.

Tube collector function over time:
Medium will be pumped through the collector array for 30s every 30 minutes. This function is disabled between 20:00 h and 06:00 h in Wolf control systems that are equipped with a BM programming module or in conjunction with a radio clock receiver.

NB:

The tube collector function results in temperatures inside the solar cylinder that exceed the selected maximum cylinder temperature. Always ensure that cold water is mixed in with hot water if the tube collector protection function is active (risk of scalding).

SOL28 / P28
Frost protection function

In systems filled with water instead of the heat transfer medium specific to Wolf, a frost protection function can be enabled (application in southern countries):

SOL28 / P28 = 1: Frost protection enabled
SOL28 / P28 = 0: Frost protection disabled (factory setting)

With frost protection enabled, medium flows through the collector array, if the collector temperature falls below 5 °C. This function remains enabled until the collector temperature has increased again by 5 K.

SOL50 / P50
Relay test

Parameter 50 enables the individual control of outputs for test purposes:

SOL50 / P50 = 1: Switching solar circuit pump 1
SOL50 / P50 = 2: Switching output A1
SOL50 / P50 = 3: Switching output A2
SOL50 / P50 = 4: Switching output A3
SOL50 / P50 = 5: Switching output A4

The assignment of outputs A1-A3 depends on the selected system configuration.
Parameter 24 determines the function of output A4.

Auxiliary functions

Blocking cylinder reheating "Solar boiler stop"

This function is only effective if the solar module is operated as part of a Wolf control system.
The set cylinder temperature is immediately set to the minimum DHW temperature at the associated BM, if solar heating was successfully completed in the 24 hours preceding 14.00 h (actual cylinder temperature captured by the SM2 > set cylinder temperature).
The cylinder will be regulated to the set cylinder temperature by the boiler if, within the last 24 hours, solar heating was not successfully completed.
A successful solar heating operation can be scanned at the associated BM and BM-Solar.

Blocking pasteurisation

This function is only effective if the solar module is operated as part of a Wolf control system.
The pasteurisation function via the boiler will be blocked if the solar yield has held a cylinder temperature, captured by the solar cylinder sensor, in excess of 65 °C for at least one hour. Blocking the pasteurisation function of the boiler is indicated at the associated BM.
To safeguard this function, set the maximum cylinder temperature (SOL06 / P06 or SOL16 / P16) higher than 65 °C:
SOL06 / P06 **> 65°C!** or SOL16 / P16 **> 65°C**

The pasteurisation function at the boiler can be selected via the associated BM programming module. For this, daily or weekly activation can be selected.

Daily pasteurisation
The pasteurisation function via the boiler will be blocked if, by 18.00 h, the cylinder temperature captured by the solar cylinder sensor exceeds 65 °C for at least one hour.

Weekly pasteurisation
The pasteurisation function via the boiler will be blocked if, by 18.00 h on the day for which pasteurisation has been scheduled, the cylinder temperature captured by the solar cylinder sensor has been held above 65 °C for at least one hour.

DHW circulation pump

With system configurations 2, 3, 4, 5, 6, 7, 9, 10 a DHW circulation pump can be connected to output A3. This function is only available in conjunction with the BM programming module with address 0. In that case the DHW circulation pump is switched via the defaulted switching times of the corresponding time program in the BM (0).

Anti-seizing pump protection

To prevent the solar circuit pump(s) from seizing because of long idle periods, it/they will be started daily (at 12.00 h) for approximately five seconds (after being idle for more than 24 hours). This function will only become effective, if the max. collector temperature (*SOLOS* / *P05*) has been exceeded.

Loading the standard values (reset)

To return to the standard values, set DIP 4 to "OFF" and back to "ON". This also resets the hours run and yield values.

Maximum cylinder and collector temperature over 24 h

The maximum cylinder and collector temperature achieved during a day (0.00 h to 24.00 h) are captured. These are saved daily at 24.00 h and can be scanned at the BM or BM-Solar.

Hours run

The hours run by the solar circuit pump(s) are captured and saved. They are displayed at the BM and BM-Solar.

Resetting values

The values for hours run, daily and total yield can be reset via the BM and BM-Solar by holding down the rotary selector for at least 10 s.

Fault codes / Changing a fuse

If the SM2 recognises a fault, the red LED flashes and the fault code of the solar module is displayed in the associated BM or BM-Solar. When using the SM2 as part of a Wolf control system, the fault code will also be displayed on the central BM programming module with address 0.

The following fault messages can occur at the SM2:

Fault code	Fault	Cause	Remedy
FC64	Pulse transducer faulty	Pulse generator or lead faulty	Check pulse generator and lead; replace, if required
FC71	Solar sensor cylinder 1 faulty	Faulty sensor or lead	Check sensor and lead; replace, if required
FC72	Sensor at input E1 faulty	Faulty sensor or lead	Check sensor and lead; replace, if required
FC73	Sensor at input E3 faulty	Faulty sensor or lead	Check sensor and lead; replace, if required
FC79	Solar sensor collector array 1 faulty	Faulty sensor or lead	Check sensor and lead; replace, if required
FC81	EEPROM fault	Parameter value outside valid range.	Reset to standard values. Briefly interrupt the power supply and check settings.

Changing a fuse:

If the SM2 shows no function at all and there is no LED display, although power is ON, check the appliance fuse and change it, if required.

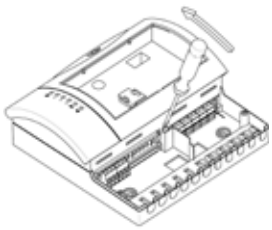
Note:

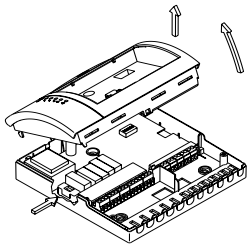
If the SM2 is operated as part of the Wolf control system, the display of one of the existing BM programming modules is retained, as this is supplied via the eBUS link to the other control components.

Prior to opening the casing, isolate the solar module from the power supply.

How to change a fuse:

1. Isolate the unit from the power supply
2. Remove the lid from the wiring chamber by undoing both screws
3. Remove the casing top with a screwdriver
4. The fuse is located on the left on the PCB below the transformer (fine-wire fuse 5x20/6.3 A/M)





Sensor resistances

NTC
Sensor resistances

Solar sensor solar cylinder 1 (SFS 1), solar sensor solar cylinder 2 (SFS 2) return sensor (RLF), bypass sensor (BPF), buffer sensor (PF)

Temp. °C	Resist. Ω	Temp. °C	Resist. Ω	Temp. °C	Resist. Ω	Temp. °C	Resist. Ω
-21	51393	14	8233	49	1870	84	552
-20	48487	15	7857	50	1800	85	535
-19	45762	16	7501	51	1733	86	519
-18	43207	17	7162	52	1669	87	503
-17	40810	18	6841	53	1608	88	487
-16	38560	19	6536	54	1549	89	472
-15	36447	20	6247	55	1493	90	458
-14	34463	21	5972	56	1438	91	444
-13	32599	22	5710	57	1387	92	431
-12	30846	23	5461	58	1337	93	418
-11	29198	24	5225	59	1289	94	406
-10	27648	25	5000	60	1244	95	393
-9	26189	26	4786	61	1200	96	382
-8	24816	27	4582	62	1158	97	371
-7	23523	28	4388	63	1117	98	360
-6	22305	29	4204	64	1078	99	349
-5	21157	30	4028	65	1041	100	339
-4	20075	31	3860	66	1005	101	330
-3	19054	32	3701	67	971	102	320
-2	18091	33	3549	68	938	103	311
-1	17183	34	3403	69	906	104	302
0	16325	35	3265	70	876	105	294
1	15515	36	3133	71	846	106	285
2	14750	37	3007	72	818	107	277
3	14027	38	2887	73	791	108	270
4	13344	39	2772	74	765	109	262
5	12697	40	2662	75	740	110	255
6	12086	41	2558	76	716	111	248
7	11508	42	2458	77	693	112	241
8	10961	43	2362	78	670	113	235
9	10442	44	2271	79	670	114	228
10	9952	45	2183	80	628	115	222
11	9487	46	2100	81	608	116	216
12	9046	47	2020	82	589	117	211
13	8629	48	1944	83	570	118	205

PT1000
Sensor resistances

Solar sensor collector, collector array 1 (SFK 1)
Solar sensor collector, collector array 2 (SFK 2)

Temp. °C	Resist. Ω	Temp. °C	Resist. Ω
-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	160	1610
50	1194	200	1758

Specification

Supply voltage	230 VAC (+10/-15%) / 50 Hz
Power consumption, electronics	< 8 VA
Max. load, output	1 A
Protection according to DIN 60529	IP 30
Safety class	I I
Permissible ambient temperature in operation	0 to 50 °C
Permissible ambient temperature during storage	-30 to +60 °C
Data memory	EEPROM (non-volatile)
Fuse protection	Fine-wire fuse 5x20 / 6.3A/M

Keyword index