

FM443 solar module

For contractors

Read carefully prior
to commissioning
or service

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1 Safety

1.1 About these instructions

This chapter contains general safety instructions, which you should observe during service work on the FM443 function module.

Also closely observe the further safety instructions, which you can find in other chapters of these service instructions. Carefully read the safety instructions before commencing the work described below.

Severe injury and even death, as well as damage to property and environmental damage, may follow if you ignore safety instructions.

1.2 Correct use

You can fit the FM443 function module into control units that are part of the Logamatic 4000 control system.

For the system to operate perfectly you will require control unit software version 4.17 or higher.

1.3 Standards and guidelines/directives



The design and operation of this product conform to European Directives and the supplementary national requirements. Its conformity is demonstrated by the CE designation.

You can view the Declaration of Conformity on the internet at www.buderus.de/konfo or request a copy from your local Buderus sales office.

1.4 Symbol key

Two levels of danger are identified and signalled by the following terms:



WARNING!

RISK TO LIFE

Identifies possible risks associated with a product that might lead to serious injury or death if appropriate care is not taken.



CAUTION!

RISK OF INJURY/ SYSTEM DAMAGE

Indicates a potentially dangerous situation which could lead to minor or moderately serious injuries or to damage to property.



USER INFORMATION

User tips for the optimum utilisation and setting of the appliance plus useful information.

1.5 Please observe these notes

The FM443 function module has been designed and built in accordance with currently recognised standards and safety requirements.

However, damage to property resulting from inappropriate service work cannot be completely prevented.

Read these service instructions thoroughly before commencing any service work on the function module FM443.



WARNING!

RISK TO LIFE

from electric shock.

- The installation, electrical wiring, commissioning, electrical connection, as well as maintenance and repairs must only be carried out by a competent contractor who adheres to all current technical regulations and requirements.
- Observe all local regulations.



WARNING!

RISK TO LIFE

from electric shock.

- Ensure that all electrical work is carried out by an authorised electrician.
- Before opening the control unit: Isolate all poles of the mains power supply and secure against unintentional reconnection.



WARNING!

RISK TO LIFE

from electric shock.

The risk of short circuits through unintentional loosening of the cores at the terminals between the 230 V and the low voltage must be prevented.

- Therefore, mutually secure the cores of each cable (e.g. with cable ties) or strip off only a very short piece of outer insulation.

**CAUTION!****RISK OF INJURY/
SYSTEM DAMAGE**

from operator error.

Operator errors can result in injury and/or damage to property.

- Ensure that children never operate the appliance unsupervised or play with it.
- Ensure that only personnel able to operate the appliance correctly have access to it.

**CAUTION!****DAMAGE TO THE DEVICE**

from electrostatic discharge (ESD).

- Before unpacking the module touch a radiator or a earthed metal water pipe to discharge any electrostatic charge in your body.

**USER INFORMATION**

Ensure that a regulation isolator is available to disconnect all poles from the mains power supply. If no isolator is available, you must fit one.

**USER INFORMATION**

Only use original Buderus spare parts. Losses caused by the use of parts not supplied by Buderus are excluded from the Buderus warranty.

1.6 Disposal

- Electronic components must not be disposed of with general domestic waste.
Dispose of old modules correctly through an authorised disposal site.

2 Product description



USER INFORMATION

Before installing the FM443 function module, check the software version of the controller module (CM431) and MEC2 programming unit (version 4.17 or higher).

Your local Buderus sales office will advise you further.

You can fit only one of the FM443 function modules into one control unit of the Logamatic 4000 control system.

The main function of the FM443 function module is to link a solar thermal system with one or two solar consumers (e.g. cylinders) to an existing control unit.

Installing the FM443 function module makes the following functions or connection options available:

- Changing operating mode
- Integrating solar consumer "1" (e.g. DHW cylinder)
- Buffer bypass circuit for central heating backup
- Cylinder in series circuit
- Integrating solar heat meter (WMZ) – available from Buderus as an accessory
- Integrating solar consumer "2" (e.g. swimming pool)
- Thermal disinfection of the pre-heat stage
- Monitoring the daily heat-up of the pre-heat stage in compliance with DVGW Code of Practice 552

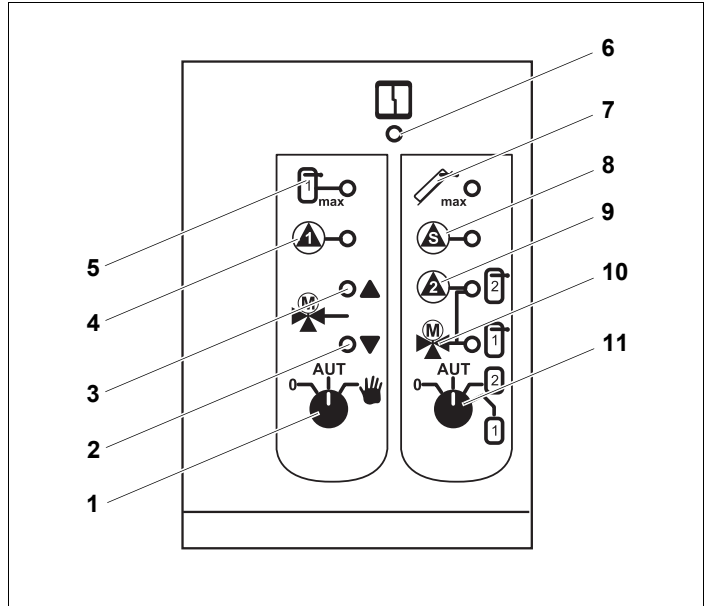


Fig. 1 Front panel – FM443 function module

- 1 Switch (solar circuit 1)
- 2 LED "Diverter valve" in case of buffer bypass circuit (central heating backup via cylinder)
- 3 LED "Diverter valve" in case of buffer bypass circuit (no central heating backup via cylinder)
- 4 Solar circuit pump 1*
- 5 Cylinder 1 maximum temperature
- 6 "Module fault" LED (red) – general module fault
- 7 Maximum collector temperature
- 8 Secondary solar circuit pump 2 or transfer or transfer pump active*
- 9 Solar circuit pump 2 or diverter valve 2 in solar circuit 2* position
- 10 Diverter valve in place of solar circuit 1
- 11 Switch (solar circuit selection)

* LED constantly ON: Pump running (100 %)
 LED "flickers": Pump modulates
 LED OFF: Pump OFF

2.1 Inputs and outputs – connection

The low voltage terminals and the 230 V outputs are available at the rear top of the FM443 function module.

Coloured labels with inscriptions matching the appropriate plugs are fitted to the strips.

Plugs are colour-coded and inscribed.

Designation	Description
Mains	Power supply
PSS2	Solar circuit pump 2
SU	Diverter valve (cylinder 1/cylinder 2)
PS2	Secondary solar circuit pump 2
SPB	Buffer bypass switching: Diverter valve
PSS1	Solar circuit pump 1

Tab. 1 Connections 230 V



USER INFORMATION

Ensure that you connect the FPB sensors correctly and install them in their correct positions depending on the type of system circuits (buffer bypass or cylinders in series).

	Designation	Description
FPB	FR	Buffer bypass switching: Return temperature sensor
	FP	Buffer bypass circuit: Buffer temperature sensor
WMZ	⊥	Earth connection
	FR	Solar circuit return temperature sensor for heat metering
	FV	Solar circuit flow temperature sensor for heat metering
	ZV	Solar circuit volume flow meter for heat metering
Sensor	FSS2	Temperature sensor for solar consumer 2
	FSS	Temperature sensor for solar consumer 1
	FSK	Collector temperature sensor

Tab. 2 Low voltage connections

2.2 Installation in Logamatic 4000 control units



USER INFORMATION

Position the FM443 function module as far to the right as possible in the control unit. This ensures that the heating circuits are allocated logically. The heating circuit modules should be inserted in the control unit starting from the left.

Install the FM443 function module into any vacant slot of the control unit series 4000 (e.g. slot 1–4 in Logamatic 43xx).

Optional slot allocation in the different control units		
412x	4211	43xx
1, 2	1, 2	1, 2, 3, 4

Tab. 3 Optional slot allocation

2.3 Switch positions



CAUTION!

SYSTEM DAMAGE

If the switch is set to "manual" for a lengthy period, this can damage the solar thermal system or even destroy system components.

- Ensure that you use manual mode only for short periods.

The various positions of the switch have different effects on the solar circuits or the two solar consumers.



USER INFORMATION

The switches should normally be in the "AUT" position.

2.3.1 Switch (solar circuit 1)



USER INFORMATION

If the switch is not in automatic mode, a message to that effect appears on the MEC2 control unit, and the "Module fault" LED on the module illuminates.

Position	Effect
	<p>Solar circuit 1 (solar circuit pump 1) and the bypass (diverter valve) are switched off.</p> <p>This setting should only be used for new installations, or when carrying out maintenance or servicing.</p>
	<p>Solar circuit 1 and the bypass are in automatic mode – this is the standard setting.</p>
	<p>Manual mode is enabled.</p> <p>Solar circuit pump 1 is switched on. The bypass is not being controlled.</p>

Tab. 4 Switch positions

If manual mode is enabled:

- An undesirable heat transfer from a hot cylinder to a cold collector array can occur.
- An undesirable heat transfer from a cold collector array to an already hot cylinder can occur – the cylinder temperature drops, so that reheating must start, for example.
- Collector protection is disabled.
- Cylinder protection is disabled.
- Collector frost protection is disabled.

2.3.2 Switch (solar circuit selection)

**USER INFORMATION**

If the switch is not in automatic mode, a message to that effect appears on the MEC2 control unit, and the "Module fault" LED on the module illuminates.

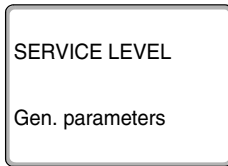
Position	Effect
	<p>Solar circuit selection is switched off.</p> <p>This setting should only be used for new installations, or when carrying out maintenance or servicing.</p>
	<p>Automatic changeover to heating solar consumers by the FM443 function module (solar module) is enabled – this is the standard setting.</p>
	<p>When there is appropriate solar yield, only solar consumer "2" (solar circuit 2) is heated.</p> <p>Automatic changeover is disabled.</p>
	<p>When there is appropriate solar yield, only solar consumer "1" (solar circuit 1) is heated.</p> <p>Automatic changeover is disabled.</p>

Tab. 5 Switch positions

3 The FM443 functions

The following sections explain how to utilise and set the various functions via the MEC2 programming unit.

3.1 Integration of the FM443 function module into the control unit

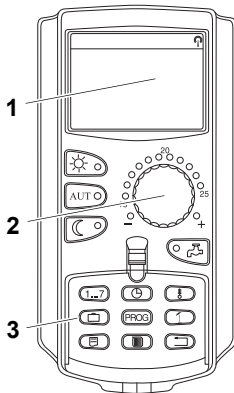


Calling up the service level

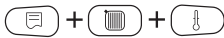
The relevant service instructions for your Logamatic 4xxx control unit explain in detail how to operate the MEC2 programming unit. The following provides a brief overview of the MEC2 operation.

The MEC2 programming unit offers two control levels (level 1 with closed flap and level 2 with open flap) plus one service level (accessible via password). Various main menus are offered at the service level, giving access to sub-menus, where you can change the settings of the control units.

Fig. 2 MEC2 programming unit



- 1 Display
- 2 Rotary selector
- 3 Function keys



To reach the service level, press the following key combination (password), until "SERVICE LEVEL – Gen. parameters" appears on the display.

Integrating the FM443 function module at the MEC2 level

After you have installed the FM443 function module (→ installation instructions "Modules for 4xxx control units") your control unit will detect it automatically when it is switched on.



USER INFORMATION

If the FM443 function module is not recognised automatically, you will need to manually install it once via the MEC2 programming unit.

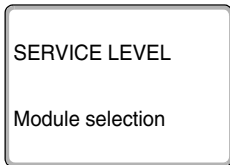
Manual integration of FM443 function module at the MEC2 level



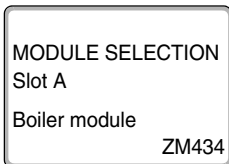
Call up the service level.



Turn the rotary selector until "SERVICE LEVEL – Module selection" appears on the display.



Press "Display" to select the main menu "MODULE SELECTION".

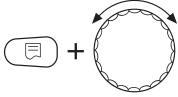


The display shows "MODULE SELECTION – Slot A".



Turn the rotary selector to the position (slot) where the FM443 function module is installed.

The FM443 function module should be installed in e.g. slot 2.

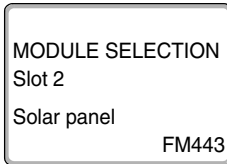


Hold "Display" down (the text on the bottom line begins to flash), and turn the rotary selector until the FM443 function module appears on the display.

Release the "Display" key.



Press "Back".



The FM443 function module (solar panel) is installed in slot 2.



Press "Back" three times or close the flap to reach operating level 1.

3.2 Changing operating mode

You can change the solar control unit operating mode.
The operating modes are as follows:

- Manual ON ("Day mode" key)
- Manual OFF ("Night mode" key)
- Automatic operation ("AUT" key)



USER INFORMATION

Collector protection is ensured with the "Manual ON" operating mode ("Day mode key").



USER INFORMATION

When the flap on the MEC2 programming unit is closed, it generally indicates the heating circuit to which the MEC2 programming unit is assigned. If the MEC2 programming unit is not assigned to any heating circuit, then the lowest installed heating circuit is always indicated.

For further details, please see the technical documentation for your control unit.

Open the flap of the MEC2 programming unit.



Press and hold down "heating circuit".



Turn the rotary selector until "Heating circuit selection – solar" appears on the display.

Release the "Heating circuit" key.

Different operating modes



Press manual ON ("day mode" key) to set the solar control unit to "permanent on".



Press the "AUT" key to set the solar control to automatic.



Press manual OFF ("night mode" key) to switch off the solar control unit.

	Input range	Factory setting
Operating mode	Automatic OFF ON	Automatic

Manual ON

No control functions are involved when the circuit is running in this mode; however, the solar thermal system will cut out if either the collector array or the cylinder(s) exceed(s) the maximum permissible temperatures.

In Const. operation:

- An undesirable heat transfer from a hot cylinder to a cold collector array can occur.
- An undesirable heat transfer from a cold collector array to an already hot cylinder can occur – the cylinder temperature drops, so that reheating must start, for example.

3.3 Solar consumer "1" – solar circuit 1

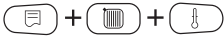
You can link an initial consumer (e.g. cylinder) into the control unit via the FM443 function module.



USER INFORMATION

Only connect one DHW cylinder for DHW heating as solar consumer "1".

3.3.1 Setting the maximum cylinder temperature



Call up the service level.



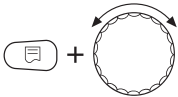
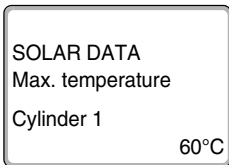
Turn the rotary selector until "SERVICE LEVEL – Solar" appears on the display.



Press "Display" to select the main menu "SOLAR DATA".



Turn rotary selector until "SOLAR DATA – Max. temperature Cylinder 1" appears on the display.



Hold down "Display" and turn the rotary selector.

You can now set the maximum cylinder temperature.

	Input range	Factory setting
Max. temperature Cylinder 1	30 °C – 90 °C	60 °C

3.3.2 Setting cylinder temperature setback (optimisation function)



Call up the service level.



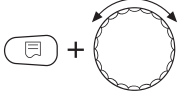
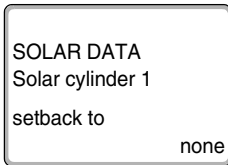
Turn the rotary selector until "SERVICE LEVEL – Solar" appears on the display.



Press "Display" to select the main menu "SOLAR".



Turn rotary selector until "SOLAR DATA – Solar cylinder 1 setback to" appears on the display.



Hold down "Display" and turn the rotary selector.

You can now adjust the cylinder temperature setback.



USER INFORMATION

The FM443 function module offers an optimisation function for increasing the solar yield. Subject to the solar yield, the reheat temperature can be reduced to the value set here.

	Input range	Factory setting
Set back cylinder 1 to	none 30 °C – 54 °C	none

3.4 Buffer integration

With this parameter you determine how the buffer cylinder if installed is to be integrated into the system.

The buffer can be linked up as follows:

- None: in other words none is installed (factory setting),
- Buffer bypass,
- Dual-purpose (cylinder) SP1,
- Dual-purpose (cylinder) SP2.



USER INFORMATION

If a buffer bypass circuit is installed in the system, enable the "bypass" function using the MEC2 programming unit. If you have enabled this function, enter the corresponding start and stop differentials.

3.4.1 Selecting the buffer integration



Call up the service level.



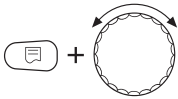
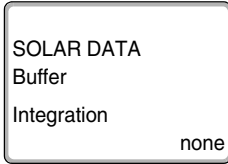
Turn the rotary selector until "SERVICE LEVEL – Solar" appears on the display.



Press "Display" to select the main menu "Solar".



Turn the rotary selector until "SOLAR DATA – Buffer Integration none" appears on the display.



Hold down "Display" and turn the rotary selector.

Now you can select the form of buffer cylinder integration.

	Input range	Factory setting
Buffer integration	none buffer bypass dual-purpose SP1 dual-purpose SP2	none

No buffer integration

If you set the integration to "none", then the module assumes that no buffer cylinder is to be taken into consideration.

Buffer bypass

If "Buffer bypass" is selected as the method of integration, then the module assumes that the solar thermal system is also to be used for central heating backup, and that the buffer cylinder is to be integrated as a return temperature raising facility for a standard heat source.

Buffer integration as dual-purpose cylinder

If "Dual-purpose SP1/SP 2" is selected as the method of integration, the module assumes that not only the solar thermal system transfers its energy to the buffer cylinder but also the standard heat source, leaving the system to be wholly or partially supplied by the buffer cylinder.

For this you can differentiate between cylinder 1 or cylinder 2 acting as the dual-purpose cylinder.

3.4.2 Setting the buffer and bypass throughput

The buffer bypass control unit regulates the changeover of the three-way valve SPB subject to the temperature differential between the buffer cylinder (FPB-FP sensor) and the system return (sensor FPB-FR).

Buffer receives throughput: Volume flow through the buffer cylinder
Bypass receives throughput: Volume flow passes the buffer by (straight into the boiler return or the low loss header)

The volume flow will be routed through the buffer cylinder when the temperature inside the buffer cylinder is greater than the temperature in the system return by the level specified under "Buffer receives throughput from ΔT ". The throughput will be routed through the buffer cylinder as long as the temperature differential between the buffer cylinder and the system return does not fall below the value selected for "Bypass receives throughput from ΔT ". If the actual differential falls below this selected value, then the bypass will be changed over for as long as the changeover threshold "Buffer receives throughput from ΔT " is not reached again.



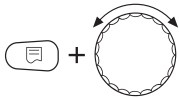
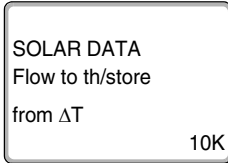
USER INFORMATION

The changeover threshold for the bypass receiving the throughput must always be smaller than the changeover threshold for the buffer receiving the throughput.

At the menu level "SOLAR DATA" you can select the changeover threshold for buffer and bypass receiving the throughput, subject to the buffer bypass circuit having been enabled.



Turn rotary selector one click clockwise until "SOLAR DATA – Flow to th/store from ΔT " appears on the display.



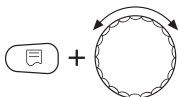
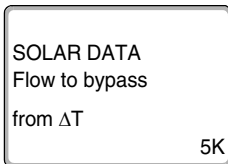
Hold down "Display" and turn the rotary selector.

Now you can select the changeover temperature differential for the buffer receives throughput.

	Input range	Factory setting
Buffer receives throughput from ΔT	7 K – 20 K	10 K



Turn rotary selector one click clockwise until "SOLAR DATA – Flow to bypass from ΔT " appears on the display.



Hold down "Display" and turn the rotary selector.

Now you can select the changeover temperature differential for the bypass receives throughput.

	Input range	Factory setting
Bypass receives throughput from ΔT	5 K – 15 K	5 K

3.5 Solar circuit heat meter

If there is a heat meter set installed in the solar circuit, you can display its values on the MEC2 programming unit display. This differentiates between the heat yield for the first and second solar consumer.

The heat volume in the second solar consumer is calculated using the pump runtime.



USER INFORMATION

You can only use this function in conjunction with the heat meter set. This set is available from Buderus as an accessory.



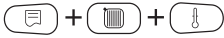
USER INFORMATION

Ensure that you connect the WMZ sensor correctly (→ Tab. 2, page 10).

Enable the "heat meter" function.

If you have enabled this function ("yes"), you must set the corresponding glycol content in the solar circuit.

3.5.1 Enabling heat metering



Call up the service level.



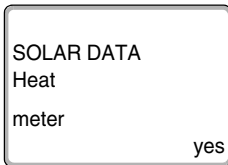
Turn the rotary selector until "SERVICE LEVEL – Solar" appears on the display.



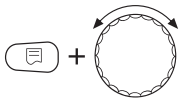
Press "Display" to select the main menu "SOLAR DATA".



Turn the rotary selector until "SOLAR DATA – Heat meter" appears on the display.



Hold down "Display" and turn the rotary selector.



You can now enable heat volume recording.

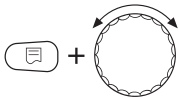
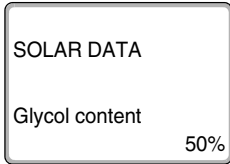
	Input range	Factory setting
Heat meter	yes no	no

3.5.2 Setting glycol content

If you have enabled heat metering, you must set the glycol content in the "SOLAR DATA" menu level.



Turn rotary selector one click clockwise until "SOLAR DATA – Glycol content" appears on the display.



Hold down "Display" and turn the rotary selector.

You can now set the glycol content.

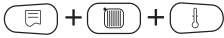


USER INFORMATION

If a solar circuit uses glycol water, you must test the glycol content with a hydrometer. The solar yield is calculated using the specific heat capacity of the medium in the solar circuit and the volume flow.

	Input range	Factory setting
Glycol content	0 % 30 % 40 % 50 %	50 %

3.5.3 Enabling the statistic function



Call up the service level.



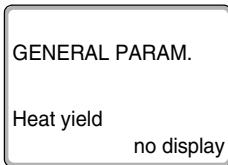
Turn the rotary selector until "SERVICE LEVEL – Gen. parameters" appears on the display.



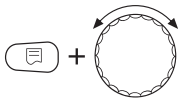
Press "Display" to call up the main menu "GENERAL PARAM.".



Turn the rotary selector until "GENERAL PARAM. Heat yield no display" appears on the display.



Hold down "Display" and turn the rotary selector.



Now you can select the display for solar data for the statistic function.

	Input range	Factory setting
Heat yield	none burner* solar	none

* only for single stage floorstanding boiler without EMS

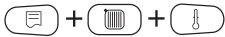
3.6 Pump function – secondary circuit pump

The solar module is equipped with a pump output that, subject to application, can be assigned to different functions.

The pump can be integrated with the following functions:

- None: in other words none is installed (factory setting),
- Sec. cylinder 2 (secondary circuit pump – cylinder 2),
- Transfer (heating the pre-heat stage),
- Transfer pump (cylinder in series circuit).

3.6.1 Selecting the buffer integration



Call up the service level.



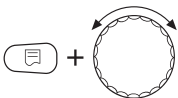
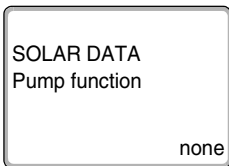
Turn the rotary selector until "SERVICE LEVEL – Solar" appears on the display.



Press "Display" to call up the main menu "Solar".



Turn the rotary selector until "SOLAR DATA – Pump function none" appears on the display.



Hold down "Display" and turn the rotary selector.

Now you can select the pump function.

	Input range	Factory setting
Pump function	none Sec. cylinder 2 Transfer Transfer pump	none

No pump function

If you select "none" as the pump function, the module assumes that no pump is connected. Consequently, this output will not be controlled by the FM443 function module.

Sec. cylinder 2

If you select "Sec. cylinder 2" as the pump function, the pump connected there will operate as a secondary circuit pump for heating the second solar consumer, i.e. the second consumer is operated via a heat exchanger.

Transfer

If you select "transfer" as the pump function, the pump connected there will heat the solar pre-heat stage, if required, once per day to 60 °C or to the thermal disinfection temperature in accordance with the DVGW Code of Practice 552, to prevent the growth of legionella bacteria.

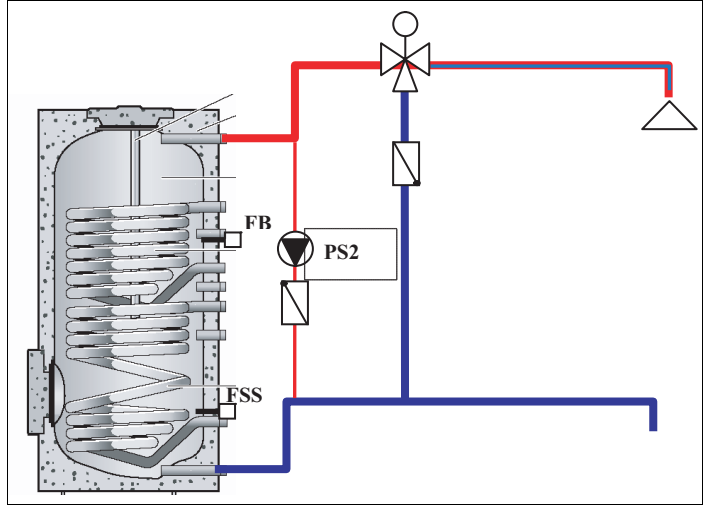


Fig. 3 Transfer in a circuit with a solar cylinder

Transfer pump

If you select "Transfer pump" as the pump function, the pump connected there is designed to transfer the energy between the solar cylinder and the cylinder heated by the boiler in a cylinder in series circuit. In other words, as soon as the solar cylinder is hotter than the cylinder heated by the boiler, pump PS2 starts and the energy is transferred from one to the other.

In addition this pump is used, if required, to heat the solar cylinder, i.e. the solar pre-heat stage, once per day to 60 °C or to the thermal disinfection temperature to prevent the growth of legionella bacteria, in accordance with the DVGW Code of Practice 552.

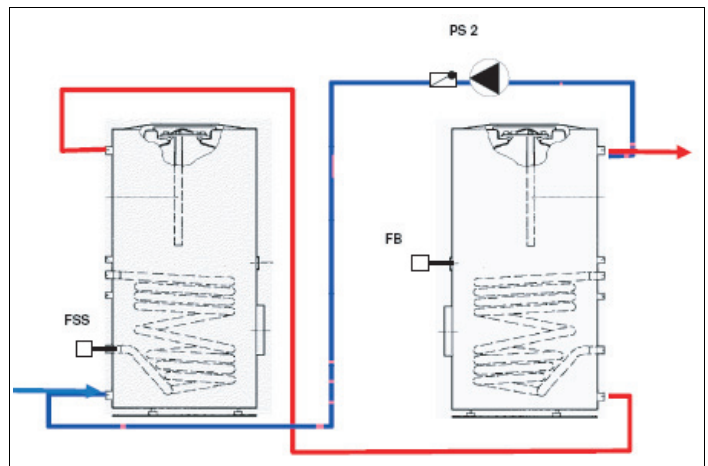
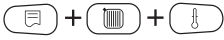


Fig. 4 Transfer for cylinder in series circuit

3.6.2 Select transfer pump start

Transfer starts when the FSS solar sensor captures a temperature higher by the value selected here than that captured at the FB DHW sensor.



Call up the service level.



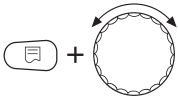
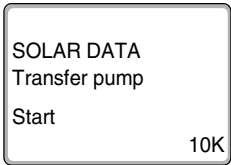
Turn the rotary selector until "SERVICE LEVEL – Solar" appears on the display.



Press "Display" to select the main menu "Solar".



Turn the rotary selector until "SOLAR DATA – Transfer pump Start 10K" appears on the display.



Hold down "Display" and turn the rotary selector.

Now you can select the start temperature differential for the transfer pump.

	Input range	Factory setting
Transfer pump Start	2 K – 10 K	5 K

3.6.3 Select transfer pump stop

Transfer stops when the temperature captured by the FSS solar sensor comes close to the temperature captured by the FB DHW sensor.



Call up the service level.



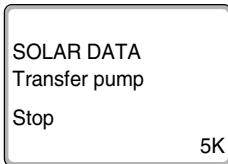
Turn the rotary selector until "SERVICE LEVEL – Solar" appears on the display.



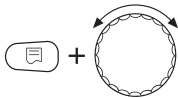
Press "Display" to select the main menu "Solar".



Turn the rotary selector until "SOLAR DATA – Transfer pump Stop 5K" appears on the display.



Hold down "Display" and turn the rotary selector.



Now you can select the start temperature differential for the transfer pump.

	Input range	Factory setting
Transfer pump Stop	2 K – 10 K	5 K

3.7 Heating up the pre-heat stage

There is an option, subject to the pump function "Transfer" or "Transfer pump" being selected, to heat up the solar pre-heat stage, i.e. the lower half of a dual-mode cylinder or the solar cylinder in a cylinder in series circuit via the boiler, as part of the thermal disinfection and/or the daily heat-up to 60 °C to prevent the growth of legionella bacteria.

The following settings are possible:

- OFF:
In other words, no heat-up of the pre-heat stage (factory setting)
- Thermal disinfection:
The pre-heat stage will only be heated up during thermal disinfection.
- Heat-up:
The pre-heat stage is only heated as part of the daily heat-up to 60 °C.
- Thermal disinfection + heat-up:
The pre-heat stage is heated up as part of thermal disinfection and during the daily heat-up to 60 °C.

3.7.1 Solar cylinder 1 – heating



Call up the service level.



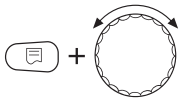
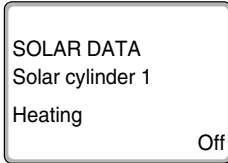
Turn the rotary selector until "SERVICE LEVEL – Solar" appears on the display.



Press "Display" to select the main menu "SOLAR".



Turn rotary selector until "SOLAR DATA – Solar cylinder 1 Heating OFF" appears on the display.



Hold down "Display" and turn the rotary selector.

Now you can adjust the heat-up of the pre-heat stage.



USER INFORMATION

The settings for daily heat-up and thermal disinfection are made at the DHW function (→ Control unit service instructions).

	Input range	Factory setting
Solar cylinder 1 – Heating	OFF Therm. disinfect Heat-up Disinfect+heat-up	none

3.8 Solar consumer "2" – solar circuit 2

If you want to connect a second solar consumer (e.g. swimming pool or buffer cylinder) via the FM443 function module to the control unit, enable the function "consumer 2".

The second consumer can be heated using a diverter valve or a separate pump.

3.8.1 Enabling second solar consumer



Call up the service level.



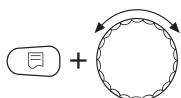
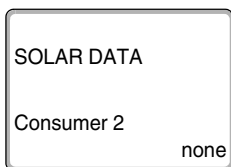
Turn the rotary selector until "SERVICE LEVEL – Solar" appears on the display.



Press "Display" to select the main menu "SOLAR DATA".



Turn the rotary selector until "SOLAR DATA – Consumer 2" appears on the display.



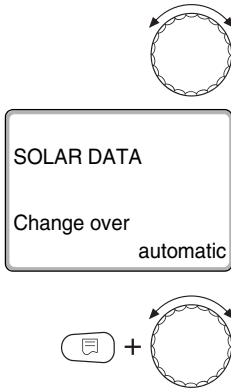
Hold down "Display" and turn the rotary selector.

You can now enable the second consumer.

	Input range	Factory setting
Consumer 2	None Three-way valve Sep. pump	none

3.8.2 Setting changeover options

If you have enabled solar consumer 2, set the changeover in the "SOLAR DATA" menu level.



Turn the rotary selector until "SOLAR DATA – Change over" appears on the display.

Hold down "Display" and turn the rotary selector.

You can now set the various changeover options.

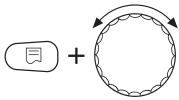
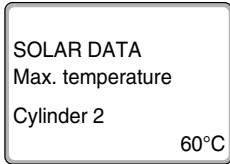
	Input range	Factory setting
Change over	automatic always cylinder 1 always cylinder 2	automatic

3.8.3 Setting the maximum cylinder temperature

If you have enabled solar consumer 2, set the maximum cylinder temperature in the "SOLAR DATA" menu level.



Turn rotary selector until "SOLAR DATA – Max. temperature Cylinder 2" appears on the display.



Hold down "Display" and turn the rotary selector.

You can now set the maximum cylinder temperature.

	Input range	Factory setting
Max. temperature Cylinder 2	20 °C – 90 °C	60 °C

4 Relay test

With the "Relay test" menu, you can check whether the external components (e.g. pumps) are correctly connected.



CAUTION!

SYSTEM DAMAGE

Proper system functioning is not guaranteed while a relay test is being carried out. The control unit disables all functions.

- Leave this function at the end of the relay test to prevent system damage.

Relay test

If you have selected the "Relay test – solar" function, you can individually switch on/off the pumps connected to the FM443 function module.

If the "Relay test" function is enabled:

- An undesirable heat transfer from a hot cylinder to a cold collector array can occur.
- An undesirable heat transfer from a cold collector array to an already hot cylinder can occur – the cylinder temperature drops, so that reheating must start, for example.
- Collector protection is disabled.
- Cylinder protection is disabled.
- Collector frost protection is disabled.



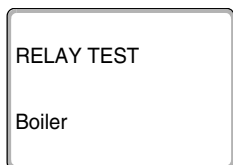
Call up the service level.



Turn the rotary selector until "SERVICE LEVEL – Relay test" appears on the display.



Press "Display" to select the main menu "Relay test".



"RELAY TEST – Boiler" appears on the display.



Turn the rotary selector until "RELAY TEST – Solar" appears on the display.



Press "Display" to select the sub-menu "RELAY TEST – Solar".

You can test the following relays to see if they function properly (on/off):

- Diverter valve
- Bypass
- Pri. pump SP1
- Pri. pump SP2
- Sec. pump SP2

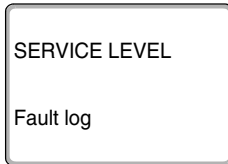
5 Fault log



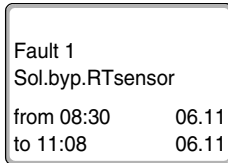
Using the "Fault log" menu, you can display the last four fault messages of your heating controller.

Call up the service level.

Turn the rotary selector until "SERVICE LEVEL – Fault log" appears on the display.



Press "Display" to select the main menu "Fault log".



The following faults can be displayed:

- Collector sensor
- Bypass buffer sensor
- Bypass return sensor
- Heat meter flow sensor
- Heat meter return sensor
- Sensor – cylinder 1, bottom
- Sensor – cylinder 2, bottom
- Flow metering
- Setting hysteresis

6 Fault



USER INFORMATION

All the faults that can arise in the interaction between the FM443 function module, the solar consumers and a heat meter are listed in the "Fault" column.

The terms in the "Fault" column show the messages as they appear on the MEC2 programming unit display.

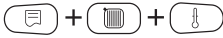
Fault	Effect on control characteristics	Possible causes of the fault	Remedy
Buffer sensor bypass	Bypass output not being controlled.	Buffer sensor faulty. Buffer sensor not connected or incorrectly connected. FM443 or control unit faulty.	Check sensor connection to FM443 function module (FPB-FP). Check sensor on bypass for breaks or incorrect position. Check, for example, the fuse.
Return sensor bypass	Bypass output not being controlled.	Return sensor faulty. Return sensor not connected or incorrectly connected. FM443 or control unit faulty.	Check sensor connection to FM443 function module (FPB-FR). Check sensor on bypass for breaks or incorrect position. Check, for example, the fuse.

Fault	Effect on control characteristics	Possible causes of the fault	Remedy
Heat meter flow sensor	Heat yield is not captured.	Flow sensor faulty. Flow sensor not connected or incorrectly connected. FM443 or control unit faulty.	Check sensor connection to FM443 function module (WMZ-FV). Check sensor on solar thermal system flow for breaks or incorrect position. Check, for example, the fuse.
Heat meter return sensor	Heat yield is not captured.	Return sensor faulty. Return sensor not connected or incorrectly connected. FM443 or control unit faulty.	Check sensor connection to FM443 function module (WMZ-FR). Check sensor on solar thermal system return for breaks or incorrect position. Check, for example, the fuse.
Collector sensor	Cylinders 1 and 2 are not being heated with solar energy.	Collector sensor faulty. Collector sensor not connected or incorrectly connected. FM443 or control unit faulty.	Check collector sensor for breaks or incorrect position. Check, for example, the fuse.
Sensor – cylinder 1, bottom	Cylinder 1 not being heated with solar energy.	Cylinder 1 sensor faulty. Cylinder 1 sensor not connected or incorrectly connected. FM443 or control unit faulty.	Check the sensor on cylinder 1 for breaks or incorrect position. Check, for example, the fuse.

Fault	Effect on control characteristics	Possible causes of the fault	Remedy
Sensor – cylinder 2, bottom	Cylinder 2 not being heated with solar energy.	Cylinder 2 sensor faulty. Cylinder 2 sensor not connected or incorrectly connected. FM443 or control unit faulty.	Check the sensor on cylinder 2 for breaks or incorrect position. Check, for example, the fuse.
Hysteresis setting	FM443 function module is switched off.	The values set by the user are not coherent. The start threshold is lower than the stop threshold, either for cylinder 1, 2 or the bypass.	Check the settings of the FM443 function module with the MEC2 programming unit.
Flow metering	Heat yield is not captured.	Flow meter faulty or incorrectly connected. FM443 function module faulty. Hydraulics are faulty.	Is the flow meter correctly connected to the FM443 function module? Check that the solar module is functioning correctly. Replace the FM443 function module if required.

7 Monitor data

Using the main menu "Monitor", you can scan current values (monitor data) from the solar control unit.



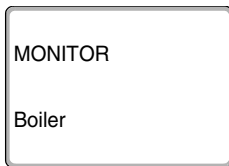
Call up the service level.



Turn the rotary selector until "SERVICE LEVEL – Monitor" appears on the display.



Press "Display" to select the main menu "MONITOR".



"MONITOR – Boiler" appears on the display.



Turn the rotary selector until "MONITOR – Solar" appears on the display.



Press "Display" to select the sub-menu "MONITOR solar".

Once inside the sub-menu, you can scan the current values and system conditions.

7.1 Solar consumer "1" – solar circuit 1

7.1.1 Collector temperature – operating mode

MONITOR SOLAR	
Collector	110°C
Cylinder 1	blocked

The display shows the current collector temperature and the operating mode of cylinder 1.

	Display options
Cylinder 1	Blocked Idle Low flow High flow Manual ON

Blocked

Cylinder 1 is not being heated because:

- the collector temperature is too high or
- the cylinder temperature is too high or
- cylinder 1 is switched off or
- another cylinder is currently being heated or
- there is a fault in the FM443 function module.

Idle

The solar energy produced by the collector is insufficient to heat cylinder 1.

LOW FLOW

Cylinder 1 is heated with a large temperature differential (low flow rate).

HIGH FLOW

Cylinder 1 is heated with a small temperature differential (high flow rate).

Manual on

The control unit is in "manual ON" operating mode.

This means that solar circuit pump 1 operates at 100 %. All control functions on the FM443 function module are disabled, except the maximum collector temperature control.

7.1.2 Temperatures in cylinder 1, status of solar circuit pump 1

MONITOR SOLAR	
SP1 centre	30°C
SP1 bottom	15°C
Pump SP1	50%

The display shows the current temperatures in cylinder 1 and the status of solar circuit pump 1.

"SP1 centre"	=	DHW heating temperature
"SP1 bottom"	=	Solar cylinder temperature, bottom
"Pump SP1"	=	Modulation factor of solar circuit pump 1

7.1.3 Solar yield

MONITOR SOLAR	
Solar yield 1	
	20000 kWh
Current	450 W

The display shows the total and current solar yield of solar circuit 1.

7.2 Buffer bypass circuit

MONITOR SOLAR	
Bypass	Off
Buffer	60°C
Return flow	30°C

The display shows the status of the three-way valve (buffer bypass circuit) as well as the temperatures of the buffer cylinder and heating return.

	Display options
Bypass	Off Direct Cylinder

Off

The buffer bypass circuit is switched off or was not enabled by the MEC2 programming unit.

The corresponding outputs are not being controlled by the solar control unit.

In this case, the diverter valve setting depends on the type of valve used. Check that the diverter valve was correctly installed.

Direct

The heating system return temperature is higher than the temperature in the lower section of the buffer or combi cylinder.

The heating return is fed directly into the boiler.

The diverter valve is in the "Bypass" setting.

Cylinder

The heating system return temperature is lower than the temperature in the buffer cylinder or the lower section of the combi cylinder.

The heating return is fed through the diverter valve for preheating via the buffer or combi cylinder.

7.3 Solar circuit heat meter

MONITOR SOLAR	
Volume	900 l/h
Flow	90°C
Return flow	30°C

The display shows the current flow captured by the flow meter (heat meter set) as well as the corresponding flow and return temperatures on the solar circuit.

7.4 Solar consumer "2" – solar circuit 2

7.4.1 Collector temperature, operating mode

MONITOR SOLAR	
Collector	110°C
Cylinder 2	blocked

The display shows the current collector temperature and the operating mode of cylinder 2.

	Display options
Cylinder 2	Blocked Idle High flow Changeover check Manual ON

Blocked

Cylinder 2 is not being heated because:

- the collector temperature is too high or
- the cylinder temperature is too high or
- cylinder 2 is switched off or
- another cylinder is currently being heated or
- there is a fault in the FM443 function module.

Idle

The solar energy produced by the collector is insufficient to heat cylinder 2.

HIGH FLOW

Cylinder 1 is heated with a small temperature differential (high flow rate).

Changeover check

The conditions for a "changeover check" are:

- solar consumer "2" is being heated and
- solar consumer "1" has been shut down (the required temperature differential for heating the cylinder is not present).

Once these conditions have been met, the solar control unit checks whether heating of solar consumer "1" is possible (this consumer has priority).

This check repeats at regular intervals (factory setting = 30 minutes), until solar consumer "1" can be heated again.

Manual on

The control system is in "manual ON" operating mode.

This means that solar circuit 2 is being controlled. All control functions on the FM443 function module are disabled, except the maximum collector temperature control.

7.4.2 Temperatures in cylinder 2, status of solar circuit pump 2 or diverter valve and secondary pump of solar heating circuit 2

MONITOR SOLAR	
SP2 bottom	30°C
3-way valve	Off
Sec. pump SP2	Off

As an example, the display shows the current temperature in cylinder 2 and the operating modes of the pumps and valves.

"SP2 bottom"	=	Temperature – solar cylinder 2, bottom
"3-way valve"	=	Diverter valve status
"SecPump SP2"	=	Secondary solar circuit pump 2

	Display options
Three-way valve	SP1 (cylinder 1) SP2 (cylinder 2) OFF
Pri. pump SP2	on/off
Sec. pump SP2	on/off

7.4.3 Solar yield

MONITOR SOLAR	
Solar yield 2	
	20000 kWh
Current	450 W

The display shows the total and current solar yield of solar circuit 2.

8 Sensor curve

- Isolate the system before taking any readings.

Troubleshooting

- Remove the sensor terminals.
- Check the resistance at the sensor lead ends using an ohmmeter.
- Check the sensor temperature with a thermometer.

Using the diagram you can check whether temperature and resistance correlate.

Collector sensor (FSK) curve

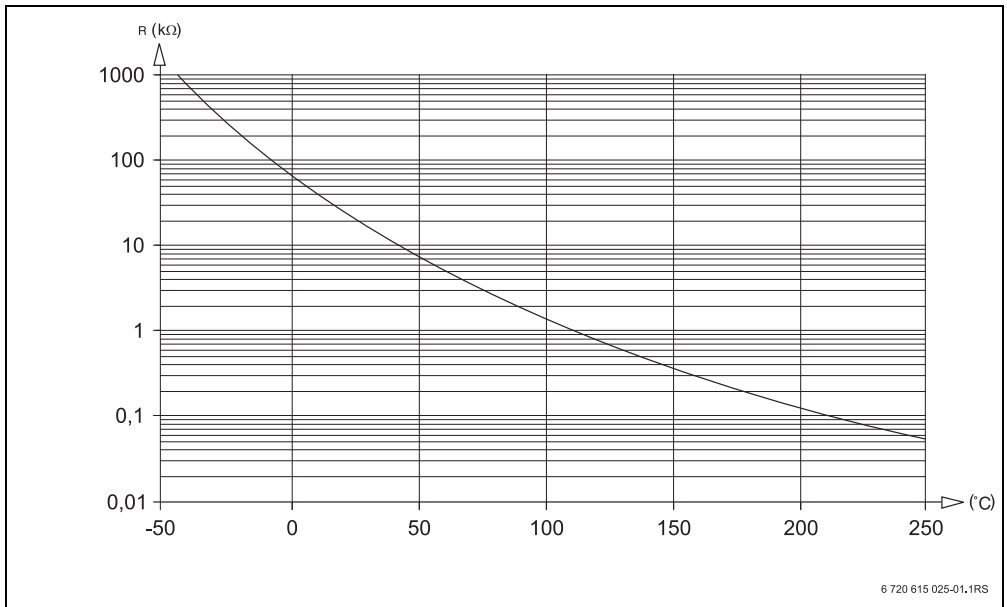


Fig. 5 Collector sensor (FSK) curve

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Buderus

Cotswold Way, Warndon, Worcester WR4 9SW

Customer service: 0870 421 5933

Technical support: 0870 421 5944

Fax: 01905 753130

www.buderus.co.uk

C & F Quadrant Ltd.

Unit L40 Cherry Orchard Industrial Estate

Cherry Orchard, Dublin 10

Tel.: 01.6305700

Fax.: 01.6305706 / 01.6305715

www.cfquadrant.ie

E-mail: sales@cfquadrant.ie

In the UK and IE, Buderus is a brand name of
Bosch Thermotechnology Ltd.

Bosch Thermotechnik GmbH

Sophienstrasse 30-32

D-35576 Wetzlar

www.buderus.de

info@buderus.de

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