

## Solar module for EMS

For heating  
contractors

Please read carefully  
prior to commission-  
ing or servicing.

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# 1 Safety

## 1.1 About this manual

This manual contains important information for the safe and correct servicing of the SM10 function module.

These service instructions are designed for heating contractors who, due to their training and experience, are familiar with heating systems, solar heating systems and DHW installations.

These service instructions supplement the installation and service instructions for the RC35.

## 1.2 Intended use

The SM10 function module can only be used in conjunction with heating systems that have the Energy Management System (EMS) from Buderus.

The SM10 function module enables the heating system to heat DHW using solar energy.

The SM10 function module can only be operated, adjusted and controlled using the RC35.

## 1.3 Please observe these notes

The SM10 function module has been designed and built in accordance with currently recognized standards and safety requirements.

However, dangers or material losses may arise if it is used improperly.

- You should therefore only operate the heating system as intended and when it is in perfect working order.
- Please read these instructions carefully.
- Always observe the safety instructions to prevent injury and material losses.



**WARNING!**

### **RISK OF LIFE**

From electric shock when the control device is open.

- Before you start working, disconnect the heating system from electrical power by shutting off the emergency shutoff switch, or the heating system circuit breaker, and take measures to prevent accidental reactivation.



**WARNING!**

### **RISK OF SCALDING**

When heating DHW using solar energy, temperatures in the solar tank may exceed 122°F (50 °C).

- Install a tempering valve to protect against scalding.



### **USER NOTE**

If a dual mode or thermosiphon tank is used, the thermal disinfection function is not available and generally not needed (see the RC35 operating instructions). If, however, you wish to use the thermal disinfection function, then other customer-supplied components are required. These are not connected to the controller.

## **1.4 Disposal**

- Dispose of old components in an environmentally responsible manner through an approved organization.

## 2 Product description

The SM10 function module can be used to control a solar heating system with a solar consumer (solar tank) for DHW heating.

Installing the SM10 function module makes the following functions available:

- Operating mode selection
- Adjusting the solar circuit control
- Using the "Optimizing the storage tank" function (see section 3.4.2 "Optimizing the storage tank", page 12)

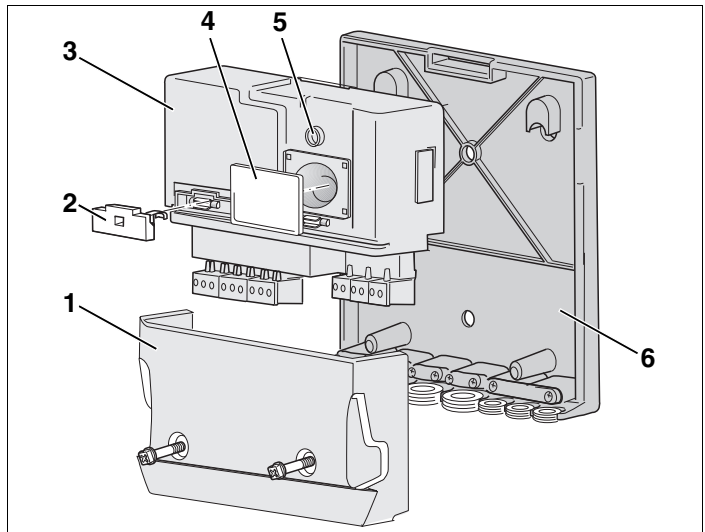


Fig. 1 SM10 function module (in this case wall-mounted)

- Item 1:** Terminal cover
- Item 2:** Access to fuse
- Item 3:** SM10 function module
- Item 4:** Access to spare fuse
- Item 5:** Operation/fault LED
- Item 6:** Wall bracket



This product has been tested and is certified for both the U.S. and Canadian markets and meets all applicable standards.

## 2.1 Inputs, outputs and connections

The SM10 function module is equipped with low-voltage terminals and 120 V outputs.

The connections are color-coded, with the same colors as the corresponding plugs.

Designation	Description
Mains	Power supply
PSS	Solar pump, max. permissible main power 120 W (I =1.0 A)

Tab. 1 Connections 120 V



### USER NOTE

Ensure that the hot and neutral cables are connected to the correct terminals and that the system is protected by a properly sized circuit breaker.

	Designation	Description
Sensor	FSS	Sensor at bottom of the solar tank (NTC)
	FSK	Collector temperature sensor (NTC)
EMS	EMS	Two communication links to the EMS bus system and/or to other function modules

Tab. 2 Low-voltage connections

## 2.2 Hydraulics – installation example

The installation example shows a solar heating system controlled by the SM10 function module with a dual-mode solar tank and Logasol KS0105 pump station.

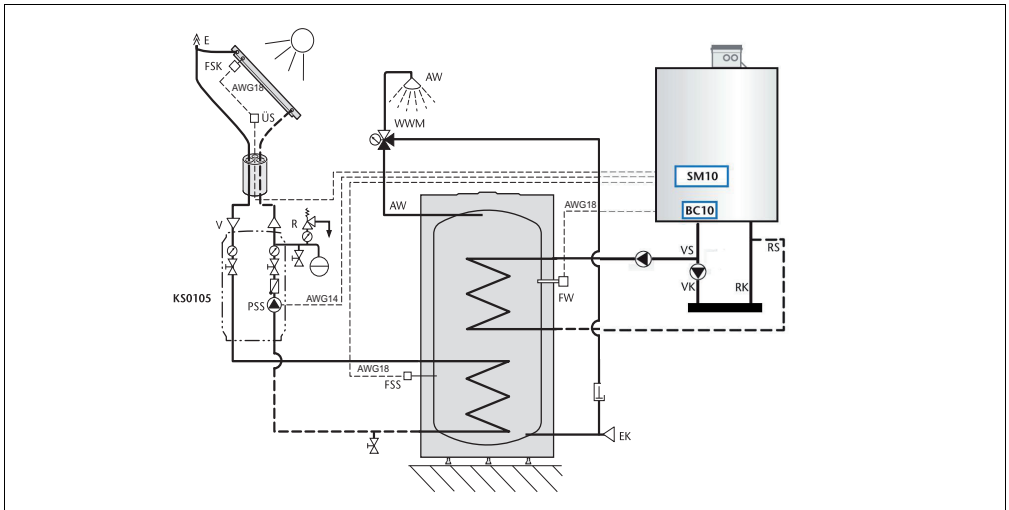


Fig. 2 Installation example with Logasol solar collectors and Logasol KS0105 complete station

AW	DHW outlet
EK	Cold water inlet
FSK	Collector temperature sensor
FSS	Sensor at bottom of solar tank
FW	DHW temperature sensor for boiler operation
PSS	Solar pump
RK	Boiler return
RS	DHW tank boiler return
VK	Boiler supply
VS	DHW tank boiler supply
WWM	Thermostatic DHW mixing valve

## 3 Commissioning the SM10

The following sections explain how to commission the solar heating system and SM10 function module, and how to adjust settings using the RC35 programming unit.

### 3.1 Notes on commissioning the solar heating system

When commissioning the solar heating system you must follow with the technical instructions for the pump station, the collectors and the solar tank.



**CAUTION!**

#### **SYSTEM DAMAGE**

From water freezing or evaporating in the solar system when the system is being commissioned in extreme weather.

- Never commission the system if the sun is shining directly on the collectors; it should only be commissioned when the sky is overcast, in the early morning or the evening, or with the collectors covered. Similarly, the system must not be commissioned when there is heavy frost.

The following procedure regarding the pump station should be strictly followed:

- Check that system is free of air.
- Check and set the flow rate.
- Record the solar controller settings in the commissioning and maintenance log.

## 3.2 Incorporating the SM10 function module in the RC35









The installation and service instructions for the RC35 explain its operation.

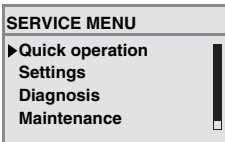
- Install the function module as described in the xM10 installation instructions, and connect to the power supply.

After you have installed the SM10 function module (see xM10 installation instructions), your RC35 will detect it automatically when powered up.

Start by accessing the service level in order to activate the solar function (see below).

### RC35: procedure for activating solar function

- Open the cover (by pulling the recessed grip on the left).
- Press  +  +  simultaneously to enter the **SERVICE MENU**.
- Press  to open the **quick operation** menu.
- Turn dial  until **Have you installed a solar module?** appears.
- Press and hold  (the value flashes) and at the same time turn dial  to change the value to **yes**.
- Release key: the changed value is saved.
- Press  several times or close the cover to return to the standard display.



### USER NOTE

Information on basic operation can be found in the RC35 service instructions.

### 3.3 Selecting the mode of operation

You can select the solar control system's mode of operation. Three modes are available:

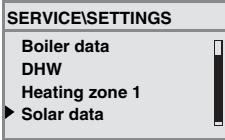
- **Automatic** (standard setting)
- **Always off** (switched off manually)
- **Always on** (manual constant operation). The solar heating system is in constant operation for 30 minutes at maximum pump output. After 30 minutes the solar heating system automatically switches back into automatic mode. The "constant operation" mode manually controls the solar circuit pump; however, the solar heating system will cut out if either the collector array or the solar tank exceed their maximum temperature (collector protection function).



#### USER NOTE

Note the time at which you switched to constant mode. When this operating mode is activated, the solar tank can discharge (cool down) so that:

- the warm heat transfer medium (e. g. glycol/water mixture) in the solar heating system will flow from the solar tank to the collector array.
- the cold (after sunset or in winter) heat transfer medium in the solar heating system (e.g. glycol/water mixture) will flow from the collector to the solar tank. The temperature in the tank will fall, and as a result the boiler may start reheating the tank.



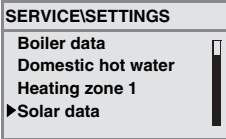
### RC35: select mode procedure




- Open service menu \ settings.
- Select **solar data** and confirm.
- Set one of the previously explained modes, normally **Automatic** (factory setting).

## 3.4 Adjusting the solar circuit control

You can incorporate in the control system a consumer for heating DHW (e.g. solar tank) using the SM10 function module.

### RC35: setting the solar circuit control procedure



- **Open service menu/settings.**
- Select **solar data** and confirm.
- Turn the dial  until the required parameter is shown.
- Press and hold  (the value flashes) and at the same time turn dial  to change the value.

#### 3.4.1 Set the maximum storage tank temperature

The temperature is measured on the DHW sensor in the center of the storage tank (FW).

Parameter:

- RC35: Select **Set the maximum solar tank temperature.**

	Input range	Factory setting
Maximum solar tank temperature	86°F - 194°F (30 °C – 90 °C)	140°F (60 °C)

#### 3.4.2 Optimizing the storage tank

This function is used to optimize the amount of solar energy relative to conventional differential solar controllers. The combined boiler - solar control system determines

- whether or not there is any solar energy and
- whether the amount of stored heat is sufficient to provide hot water.

The control system then reduces the target hot water temperature to be produced by the boiler in accordance with these two values. If there is sufficient solar energy, there is therefore no need to top up the tank with the boiler, and the number of burner starts is significantly reduced. This has the effect of saving primary energy and reducing emissions.

To activate "optimizing the storage tank", set the "minimum tank temperature" parameter. The parameter determines by how much the DHW temperature can be decreased. This means that the control can be adjusted between

- an optimum amount of solar energy when the hot water temperature is limited slightly, and
- the most comfortable temperature when heating the water using the boiler and the solar heating system.

### Example

DHW at a minimum temperature of 104°F (40 °C) should be available to the user at all times.

- Set the minimum tank temperature to 104°F (40 °C) in the RC35.

Parameter:

- RC35: Select **Set the minimum solar tank temperature**.

	Input range	Factory setting
Minimum storage tank temperature	86°F - 130°F (30 °C – 54 °C)  OFF (corresponding to 130°F (55 °C))	OFF

### 3.4.3 Setting the minimum pump-rating

This is used to adjust the minimum pump-rating to the heating system if necessary, e.g. in the case of high system resistances.

Parameter:

- RC35: Select **What is the minimum pump rating?**

	Input range	Factory setting
Pump rating	20 – 100	30

## 4 Diagnosis

### 4.1 Function test (relay test)

The **Diagnosis/function test** menu can be used to control the solar pump in order to test its function.



**CAUTION!**

#### **SYSTEM DAMAGE**









The function of the whole solar and conventional heating system is not guaranteed whilst a function/relay test is being carried out. The control system deactivates all safety functions.

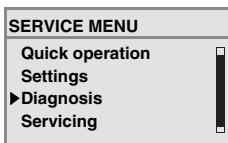
- Leave this menu after the test to prevent damage to the boiler and solar heating system.

If the function/relay test function is activated, it can lead to discharging (cooling) the solar tank in such a way that:

- the warm heat transfer medium (e.g. glycol/water mixture) in the solar heating system will flow from the solar tank to the collector array.
- the cold (e.g. after sunset or in winter) heat transfer medium in the solar heating system (e.g. glycol/water mixture) will flow from the collector to the solar tank. The temperature in the tank will fall, and as a result the boiler may start to reheat the tank.

**RC35: function test procedure**

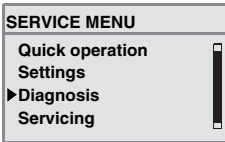
- Press  +  +  simultaneously to open the **SERVICE MENU**.
- Turn dial  counter-clockwise until **diagnosis** is selected (marked ).
- Press  to open the **SERVICEDIAGNOSIS** menu.
- Open the **DIAGNOSIS/function test** menu.
- Press any key to activate the message.
- Select **Solar** and open.
- Press and hold  (the value flashes) and at the same time turn dial  to switch the **solar pump** "ON" or "OFF".










## 4.2 Diagnosis

You can use the Diagnosis menu to display the set and actual values for the solar heating system.

### RC35: diagnosis procedure



- Press  +  +  simultaneously to open the **SERVICE MENU**.
- Turn dial  counter-clockwise until **diagnosis** is selected (marked .
- Press  to open the **SERVICE\DIAGNOSIS** menu.
- Open the **DIAGNOSIS\monitor value** menu.
- Press any key to activate the message.
- Select **Solar** and open.
- Turn the dial  to display other values.

### 4.3 Error message (fault list)

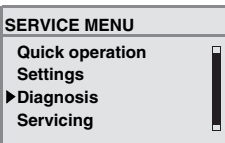
The most recent fault from the fault memory can be displayed using the **Error message** (e.g. to investigate a fault.)

Faults of the solar heating system are assigned to the category **system faults**. The heating system continues to run – where possible – during the fault state; no reset is necessary.









#### USER NOTE

The faults that can be displayed in conjunction with the SM10 function module are shown in Chapter 5 "Troubleshooting", page 19.



#### RC35: error message procedure

- Press  +  +  simultaneously to open the **SERVICE MENU**.
- Turn dial  counter-clockwise until **diagnosis** is selected (marked ►).
- Press  to open the **SERVICE\DIAGNOSIS** menu.
- Open the **DIAGNOSIS\error message** menu.
- Select **System faults** and open.
- Turn the dial  to display the next message.

## 5 Troubleshooting

Any faults in your solar heating system or your solar consumer (solar tank) will be displayed on your RC30/RC35 programming unit display. The display will show the message "PLEASE OPEN COVER: FAULT".

- Open the cover of the RC35.



If there are several faults, turn the dial until the faults affecting the solar heating system or the solar consumer (solar tank) are displayed.



### USER NOTE

All the faults that can arise in the interaction between the SM10 function module and the solar consumer are listed in the "Fault" column.

Other faults are described in the technical documentation for the boiler.

Fault	Effects on the control characteristics	Possible causes of the fault	Remedy
Collector temperature sensor FSK	Pump is switched off.	Collector temperature sensor FSK is faulty. FSK collector temperature sensor not connected, or incorrectly connected.	Check the sensor connection. Check collector sensor for breaks or incorrect installation position.
FSS sensor at bottom of solar tank	The solar tank is not charged using solar energy. The pump is switched off.	FSS sensor at bottom of solar tank faulty. The FSS sensor at the bottom of the solar tank is not connected, or is connected incorrectly.	Check the sensor connection. Check solar tank sensor for breaks or incorrect installation position.

Tab. 3 Faults in connection with the SM10 function module

<sup>1</sup> The function module contains a spare fuse.

<b>Fault</b>	<b>Effects on the control characteristics</b>	<b>Possible causes of the fault</b>	<b>Remedy</b>
No communication	Solar control continues to run in normal mode with its usual settings, but without hot water optimization.	There is no communication between the RC35 and the SM10. Function module faulty / missing. Communication lines between the function module and EMS are faulty / missing.	Check / restore operating voltage. Check communication lines between the function module and EMS. Check/replace fuse <sup>1</sup> . Replace function module.
LED on function module SM10 is flashing.	No communication, or sensor is faulty.	There is no communication between the RC35 and the SM10. Sensor is faulty. Function module faulty. Communication lines between the function module and EMS are faulty / missing.	Check communication lines between the function module and EMS. Check sensor. Replace function module.
LED on function module SM10 is off.	Solar heating system is not operating.	No operating voltage present. Fuse is burnt through.	Restore operating voltage. Replace fuse <sup>1</sup> .
Incorrect solar setting	Solar heating system not running as its maximum efficiency	System data entered incorrectly, e.g. minimum tank temperature greater than maximum tank temperature.	Check the setting values and correct, if required.

Tab. 3 *Faults in connection with the SM10 function module*

<sup>1</sup> *The function module contains a spare fuse.*



### USER NOTE

The last faults that have occurred can be retrieved from the fault list (Chapter 4.3 "Error message (fault list)", page 18).

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