

## Service Instructions

### FM 445 Function Module External Heat Exchanger module



burners

# Foreword

These serving instructions contain important information for the safe and intended operation of your heating system with the Logamatic 4000 controls.

Read these serving instructions thoroughly before start-up. All work which involves opening the controls must be carried out by a trained technician. There are no user-servicable parts inside this controls.

Disconnect the heating system and controls from the main power by shutting off the emergency shutoff switch or by disengaging the heating system circuit breaker and lock to prevent from accidental reconnection.

Have malfunctions repaired immediately by a trained technician.



**WARNING!**

**WARNING:** Hot water can scald. A thermostatic or tempering valve is strongly recommended on the DHW for anti scald protection.

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



It is the installer's responsibility to ensure that the heating system and all of its components meet all applicable local and national codes.

**The right to make technical changes is reserved.**

Illustrations, function steps and specifications may vary slightly as a result of continuous development.

### **Updating documentation**

If you have any suggestions for improvement or if you have discovered any errors, please contact us.

<b>1</b>	<b>Safety</b> . . . . .	<b>.4</b>
1.1	Correct use . . . . .	.4
1.2	Please observe these notes . . . . .	.4
1.3	Important instructions for commissioning . . . . .	.4
1.4	Cleaning control . . . . .	.4
1.5	Disposal. . . . .	.4
<b>2</b>	<b>FM445 Function Module</b> . . . . .	<b>.5</b>
2.1	DHW function . . . . .	.6
2.2	FM445 in the Logamatic 4311 control . . . . .	.7
<b>3</b>	<b>Setting FM445 functions with the MEC2</b> . . . . .	<b>.8</b>
3.1	Setting shutdown differential . . . . .	.8
3.2	Setting start-up differential . . . . .	.10
3.3	Selecting LAP primary loop . . . . .	.11
3.4	Setting actuator runtime . . . . .	.12
3.5	External fault message (WF1/WF2). . . . .	.13
3.6	Selecting and setting thermal disinfection . . . . .	.14
3.7	Allowing circulation pump to continue running during DHW heating . . . . .	.19
3.8	DHW monitor data . . . . .	.20
<b>4</b>	<b>Troubleshooting</b> . . . . .	<b>.22</b>

# 1 Safety

## 1.1 Correct use

The Logamatic 4000 controls are only for controlling heating systems in apartment buildings, residential buildings and other buildings.

## 1.2 Please observe these notes

- Only use the controls for the purposes for which they are intended and only use if they are in perfect working order.
- Read the service manual carefully before starting work on the control.



### DANGER TO LIFE

from electric shock.

**WARNING!**

- Make sure that all electrical work is carried out by a licensed contractor.
- Before opening the control: disconnect electrical power completely and lock to prevent accidental reconnection.



### SYSTEM DAMAGE

from freezing.

The heating system can freeze up in cold weather if it is shut down.

**WARNING!**

- Protect a disabled heating system from freezing by draining the boiler and water pipes at the lowest point.



### NOTICE

Make sure that a circuit-breaker for disconnecting all poles from the mains is present. If there is no circuit-breaker, you will need to install one.



### NOTICE

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

## 1.3 Important instructions for commissioning

- Before switching on the control check that the manual switches on the control and the function modules are set to "AUT".
- A setup log is included in the operating instructions for information of the system operator. Record the settings made during initial setup and the layout of the heating circuits in the setup log.

## 1.4 Cleaning control

- Clean the control with a damp cloth only.

## 1.5 Disposal

- Dispose of the controller packaging in an environmentally responsible manner.
- Dispose of a discarded control in an environmentally responsible manner through an approved organization. The lithium battery on the CM431 module must be removed from the control and disposed of separately.

## 2 FM445 Function Module

The FM445 module controls the DHW supply by storage system with an external heat exchanger (LAP/LSP).

It operates in connection with two circulators (primary and secondary pump).

The FM445 can be used with floor-standing and wall-mounted boilers with three sensors (On/Off and heat exchanger sensors).

This module has

- connections for two pumps,
- connection for one recirculation pump,
- potential-free output,
- actuation of a three-way motorized mixing valve,
- protection for scale built-up,
- thermal disinfection.

It must be connected in the first slot from the right of the controller. This is the only way to ensure power supply to the other modules. This module can be installed in the Logamatic 4311 control only if an FM441 is **not** installed.

Operate the FM445 function module from the MEC2. Plain-text messages on the operation of the FM445 or if faults occur are displayed on the MEC2 (see operating instructions for control).

The manual switches on the module are for service and maintenance only and affect 120V outputs only.

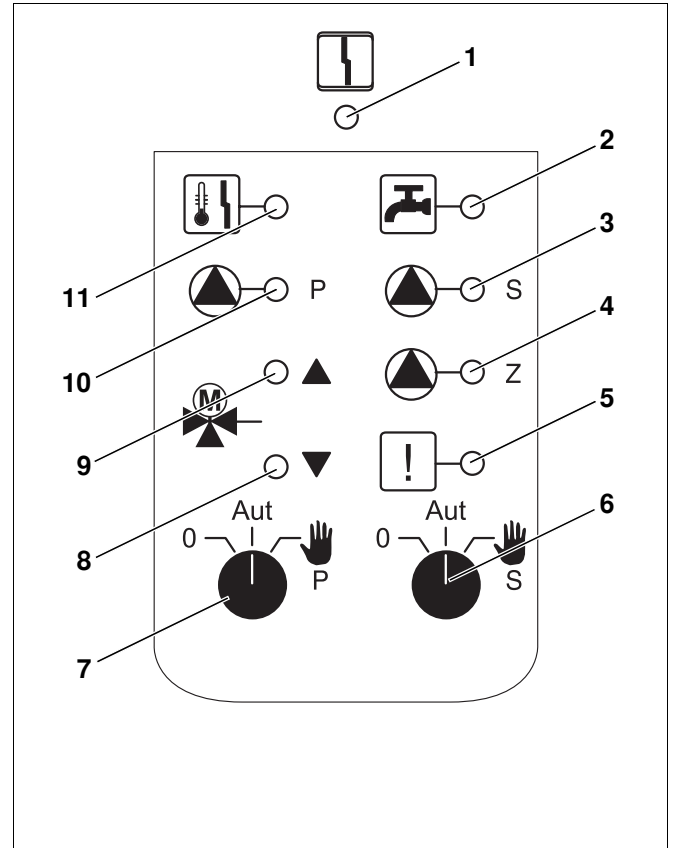



Fig. 1 FM445 controls

- Item 1:** General fault  
e.g. building fault, sensor fault, external fault, wiring fault, internal module fault, manual mode.  
The fault messages are displayed as plain text on the MEC2 control panel.
- Item 2:** Hot water is/remains below the set temperature in off (night) mode.
- Item 3:** Secondary tank pump in operation
- Item 4:** Recirculation pump in operation
- Item 5:** Thermal disinfection active
- Item 6:** Secondary pump manual switch
- Item 7:** Primary pump manual switch
- Item 8:** "Mixing valve closing" (colder)
- Item 9:** "Mixing valve opening" (hotter)
- Item 10:** Primary tank pump in operation
- Item 11:** Scale build-up protection active, secondary pump cycling

If the manual switches are not in automatic position, the MEC2 shows a message to this effect and the  fault display lights.

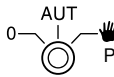
Do not use the manual switches to shut off the installation for temporary absence. Please use the holiday function for this (see controller operating manual).

The control functions continue to operate in manual mode.

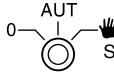
## 2.1 DHW function


### DHW manual switch


for primary circuit:



for secondary circuit:



The **0** and **manual operation** () positions are special settings that should only be used by technicians.

- : Primary/secondary pump is switched on. The mixing valve is disconnected and can be operated manually.
- AUT: DHW loading system operates in automatic mode.
- 0: Primary/secondary pump and recirculation pump are switched off. The mixing valve is disconnected. The control functions continue to operate.

Current functions are shown by indicator lights.



#### NOTICE

In normal operation the manual switch should be in the AUT position.



#### RISK OF SCALDING

People may be scalded during manual operation.

- Always turn on the cold-water faucet first and mix in hot water as required.

**WARNING!**

## 2.2 FM445 in the Logamatic 4311 control

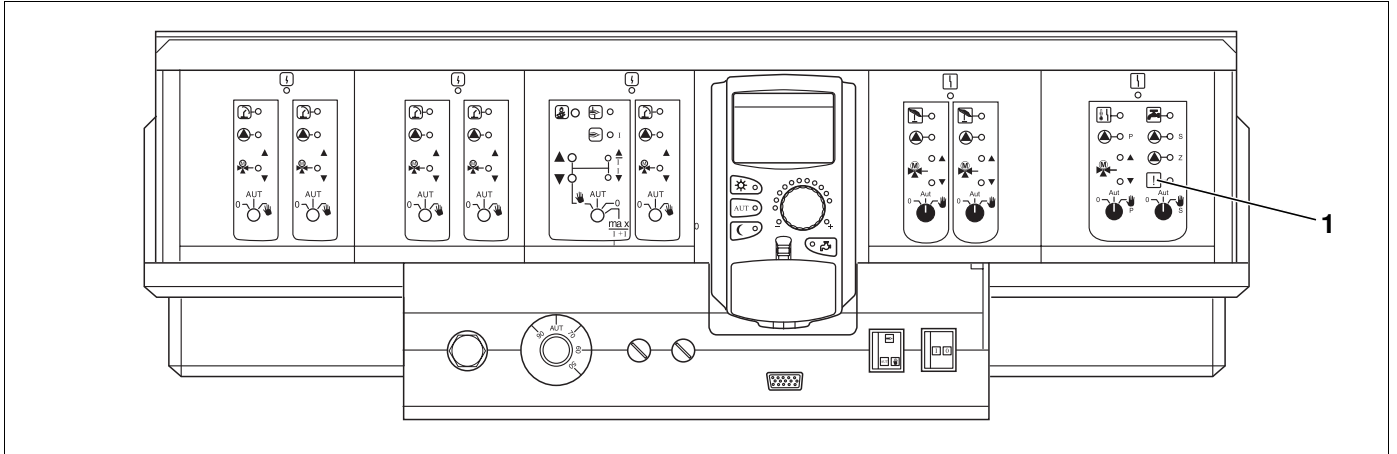


Fig. 2 FM445 in the Logamatic 4311 control

**Item 1:** FM445 in slot 4

### 3 Setting FM445 functions with the MEC2

After the function module is inserted in the control, the following functions can be selected and set with the MEC2.

- Setting shut-off differential
- Setting start-up differential
- Selecting LAP primary loop
- Setting actuator runtime
- Setting up external fault message
- Selecting and setting thermal disinfection
- Allowing circulation pump to continue running during DHW heating



#### NOTICE

For more information on the settings of the MEC2 see the technical documentation for the control.

#### 3.1 Setting shutdown differential

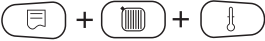
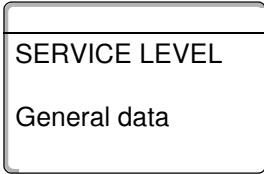

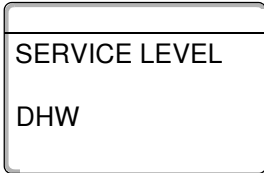

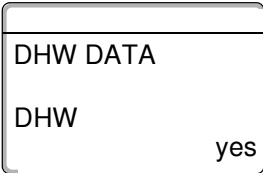

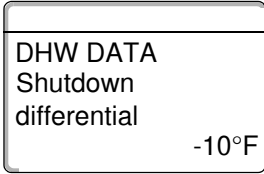



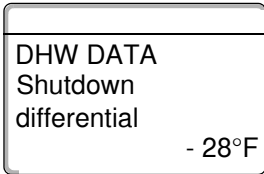

After selecting the FM445 LAP module in the MEC2, the "Shutdown differential" allows setting the temperature of the "shutdown sensor" when DHW will be satisfied.

The shutdown sensor is generally located at the bottom section of the tank.



#### NOTICE

Shutdown temperature = DHW set value – shutdown differential

Action	Display	Notes/instructions
<p>Calling up the service level</p>  <p>Press and release the buttons simultaneously.</p>		<p>This activates the service level.</p> <p>The first menu item "DHW" is displayed.</p> <p>The value (in this case "-10 F") flashes.</p> <p>Set the desired value, in this case "-28 F"</p> <p>Return to next higher level.</p>
 <p>Turn the dial until "DHW" appears.</p>		
 <p>Press and release button.</p>		
 <p>Turn the dial until "Shutdown differential" appears.</p>		
 <p>Press/hold down.</p>		
 <p>Rotate dial.</p>		
 <p>Release to save the input.</p>		
 <p>Press.</p>		

	Input range	Factory setting	own input
differential	-28 to -4 °F ( -15 to -2 °C)	-10 °F (-5 °C)	

### 3.2 Setting start-up differential

If you have selected the FM445 LAP module when selecting the module in the MEC2 programming unit, the "Start-up hysteresis" function can be used to set the value at which the temperature at the "start-up sensor" must fall compared to the shutdown temperature (but not compared to the DHW set value) before heating can start.



#### NOTICE









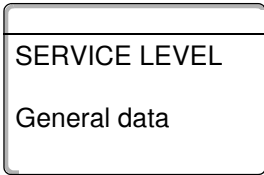
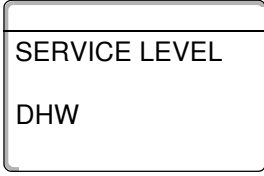
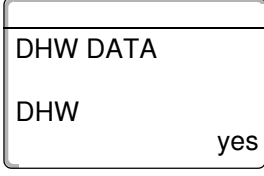
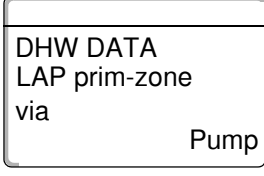
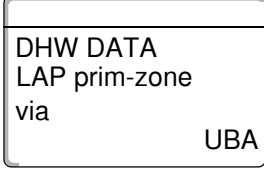
Start-up temperature = shutdown temperature – start-up differential

Action	Display	Notes/instructions
Calling up the service level + + Press and release the buttons simultaneously.		This activates the service level.
Turn the dial until "DHW" appears.		
Press and release button.		The first menu item "DHW" is displayed.
Turn the dial until "Switch-on differential" appears.		The value (in this case -10 °F ) flashes.
Press/hold down.		
Rotate dial.		Set the desired value, in this case – 28 °F.
Release to save the input.		
Press.		Return to next higher level.

	Input range	Factory setting	own input
differential	-28 to -4° F (-15 to -2 °C)	– 10 °F (- 5 °C)	

## 3.3 Selecting LAP primary loop

After the FM445 LAP module has been selected in the MEC2, the type of primary loop regulation can be set with the "LAP primary circuit" function.

Action	Display	Notes/instructions
<p>Calling up the service level</p>  <p>Press and release the buttons simultaneously.</p>  <p>Turn the dial until "DHW" appears.</p>  <p>Press and release button.</p>  <p>Turn the dial until "LAP primary circuit" appears.</p>  <p>Press/hold down.</p>  <p>Rotate dial.</p>  <p>Release to save the input.</p>  <p>Press.</p>	    	<p>This activates the service level.</p> <p>The first menu item "DHW" is displayed.</p> <p>The selected primary zone (in this case pump) flashes.</p> <p>Set the desired primary zone, in this case UBA.</p> <p>Return to next higher level.</p>

	Input range	Factory setting	own input
LAP primary circuit	Pump Actuator UBA (see list below)*	Pump	

\* Only in combination with Buderus wall-mounted boilers with UBA 1.5.

## Approved boiler types

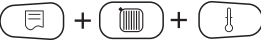
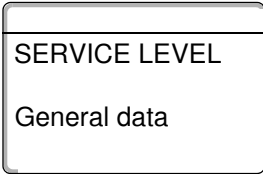

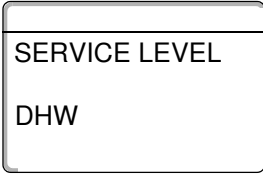

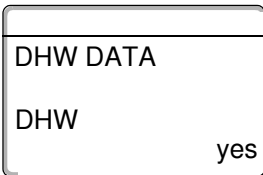

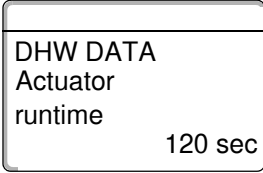

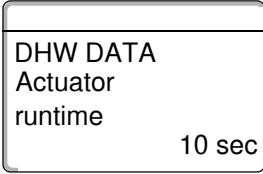


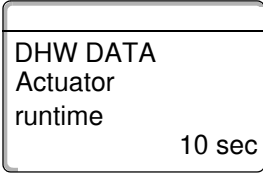



### NOTICE

The "LAP primary circuit via UBA" function may only be used with the following boiler types. Note the KIM number.

## 3.4 Setting actuator runtime

After an actuator has been selected in the "LAP primary circuit" menu in the MEC2 programming unit, the actuator runtime can be set.

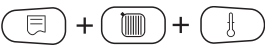
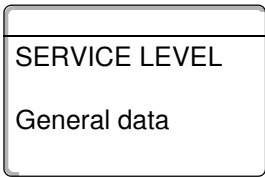

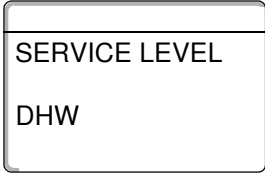

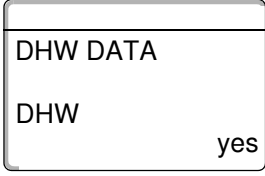


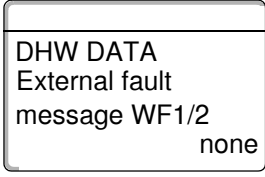


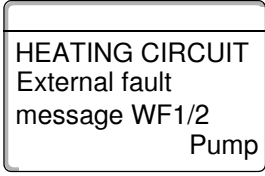

Action	Display	Notes/instructions
Calling up the service level  Press and release the buttons simultaneously.		This activates the service level.
 Turn the dial until "DHW" appears.		
 Press and release button.		The first menu item "DHW" is displayed.
 Turn the dial until "Actuator runtime" appears.		
 Press/hold down.		The selected value (in this case 120 sec) flashes.
 Rotate dial.		
 Release to save the input.		Set the desired value (in this case 10 sec).
 Press.		

	Input range	Factory setting	own input
Actuator runtime	10 – 600 sec	120 sec	

## 3.5 External fault message (WF1/WF2)

An external potential-free fault message contact of a loading pump, a three-way valve or an inert anode can be connected to terminals WF1 and WF2 on the ZM 424, FM441 and FM445 modules.

- WF1 and WF2 contacts closed = no fault,
- WF1 and WF2 contacts open = fault.

Action	Display	Notes/instructions
<p>Calling up the service level</p>  <p>Press and release the buttons simultaneously.</p>		<p>This activates the service level.</p>
<p> Turn the dial until "DHW" appears.</p>		
<p> Press and release button.</p>		<p>The first menu item "DHW" is displayed.</p>
<p> Rotate the dial until "External fault message WF1/2" appears.</p> <p> Press/hold down.</p>		
<p> Rotate dial.</p> <p> Release to save the input.</p>		<p>The fault message (in this case none) flashes.</p> <p>Set the desired value, in this case pump.</p>
<p> Press.</p>		<p>Return to next higher level.</p>

	Input range	Factory setting	own input
Fault message (depending on boiler and module)	none Inert anode Pump 3-way switching valve	none	


### 3.6 Selecting and setting thermal disinfection

**This function is not available if "UBA throughput" has been selected as DHW tank type.**

When the "Thermal disinfection" function is selected, the DHW is heated once a week to a temperature sufficient to kill pathogens (e.g. legionella).

When "Thermal disinfection yes" has been selected, the default program will be used unless a custom program has been entered.

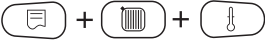
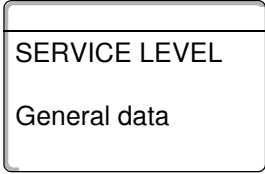

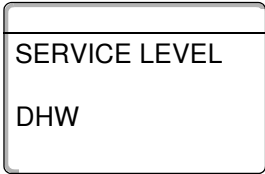

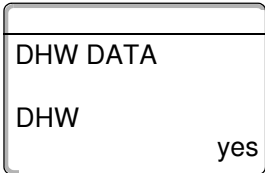

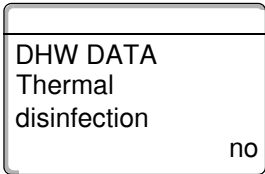



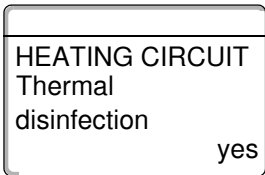

default: every Tuesday at 1:00 a.m. to 158 °F (70 °C).

The operation of the thermal disinfection process is shown by the LED display .



#### NOTICE

The "Thermal disinfection" function is not available if thermal disinfection was previously selected in the "External contact WF 1/3" function.

Action	Display	Notes/instructions
<p>Calling up the service level</p>  <p>Press and release the buttons simultaneously.</p>		<p>This activates the service level.</p>       <p>The first menu item "DHW" is displayed.</p>       <p>The value (in this case no) flashes.</p> <p>Set the desired value, in this case yes.</p>       <p>Return to next higher level.</p>
 <p>Turn the dial until "DHW" appears.</p>		
 <p>Press and release button.</p>		
 <p>Turn the dial until "Thermal disinfection" appears.</p>		
 <p>Press/hold down.</p>		
 <p>Rotate dial.</p>		
 <p>Release to save the input.</p>		
 <p>Press.</p>		

	Input range	Factory setting	own input
Thermal disinfection	yes/no	no	

### Setting disinfection temperature

The disinfection temperature can be set with the "Disinfection temperature" function.

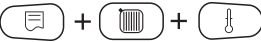
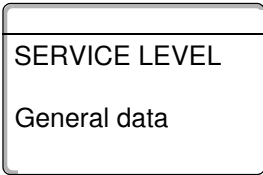

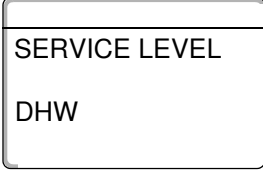

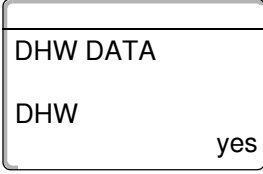

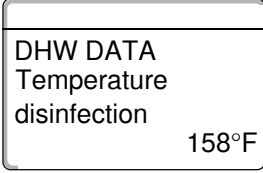

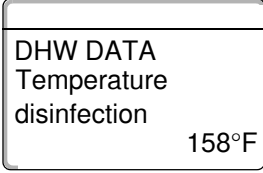

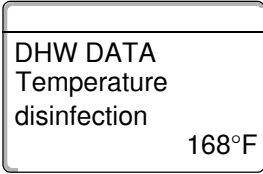

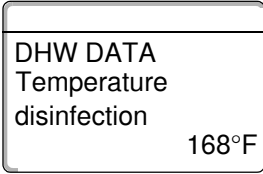

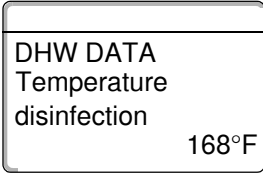


**WARNING!**

#### RISK OF SCALDING

from hot water if there is no thermostatically controlled mixer installed.

- Instruct your customers not to use hot water during and shortly after thermal disinfection unless it is mixed.

Action	Display	Notes/instructions
Calling up the service level  Press and release the buttons simultaneously.		This activates the service level.
 Turn the dial until "DHW" appears.		
 Press and release button.		The first menu item "DHW" is displayed.
 Turn the dial until "Disinfection temperature" appears.		
 Press/hold down.		The value (in this case 158 °F (70 °C)) flashes.
 Rotate dial.		
 Release to save the input.		Set the desired value, in this case 168 °F ( 76 °C).
 Press.		
		Return to next higher level.

	Input range	Factory setting	own input
Disinfection temperature	150 – 168 °F (66 – 76 °C)	158 °F (70 °C)	


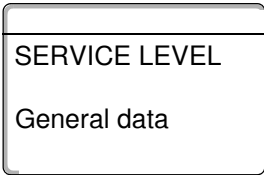

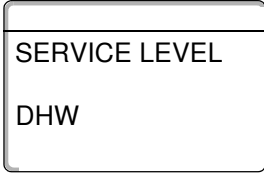

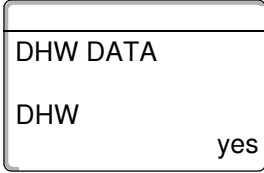

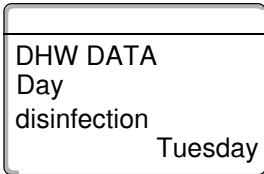



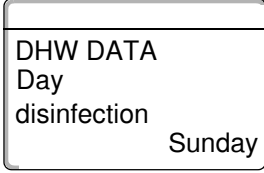

## Setting day of week for disinfection

The day of the week for disinfection can be set with the "Day of the week for disinfection" function.



### NOTICE

The "Day of the week for disinfection" function is not shown if thermal disinfection was previously selected with the "External contact WF 1/3" function.

Action	Display	Notes/instructions
<p>Calling up the service level</p>  <p>Press and release the buttons simultaneously.</p>		This activates the service level.
 <p>Turn the dial until "DHW" appears.</p>		
 <p>Press and release button.</p>		The first menu item "DHW" is displayed.
 <p>Turn the dial until "Day of the week for disinfection" appears.</p>		
 <p>Press/hold down.</p>		The day (in this case Tuesday) flashes.
 <p>Rotate dial.</p>		
 <p>Release to save the input.</p>		Set the desired day, in this case Sunday.
 <p>Press.</p>		Return to next higher level.

	Input range	Factory setting	own input
Day disinfection	Monday – Sunday	Tuesday	

We reserve the right to make any changes due to technical modifications.


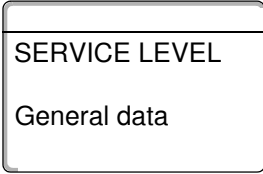

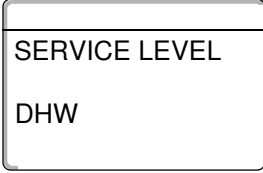

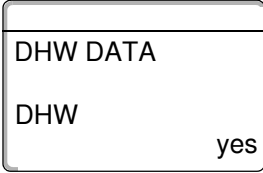

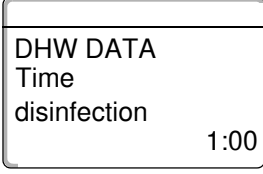



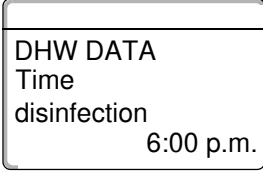

## Setting time of day for disinfection

The time of day for disinfection can be set with the "Time of day for disinfection" function.



### NOTICE


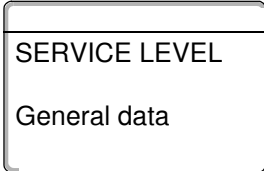

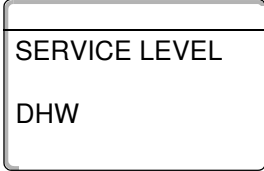

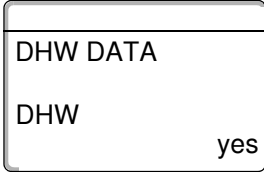

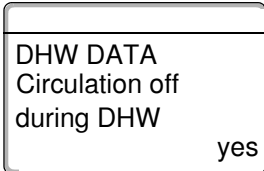



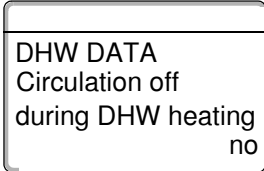

The "Time of day for disinfection" function is not shown if thermal disinfection was previously selected with the "External contact WF 1/3" function.

Action	Display	Notes/instructions
<p>Calling up the service level</p>  <p>Press and release the buttons simultaneously.</p>		<p>This activates the service level.</p> <p>The first menu item "DHW" is displayed.</p> <p>The time (in this case 1:00 a.m.) flashes.</p> <p>Set the desired time, in this case 6:00 p.m.</p> <p>Return to next higher level.</p>
 <p>Turn the dial until "DHW" appears.</p>		
 <p>Press and release button.</p>		
 <p>Turn the dial until "Disinfection time" appears.</p>		
 <p>Press/hold down.</p>		
 <p>Rotate dial.</p>		
 <p>Release to save the input.</p>		
 <p>Press.</p>		

	Input range	Factory setting	own input
Time of disinfection	0 – 11 p.m.	1 a.m.	

## 3.7 Allowing circulation pump to continue running during DHW heating

This feature allows selecting if the circulation pump runs during DHW heating.

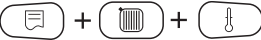
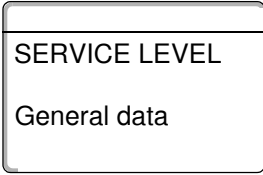

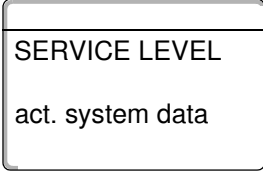





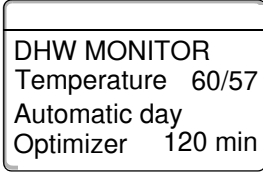
Action	Display	Notes/instructions
<p>Calling up the service level</p>  <p>Press and release the buttons simultaneously.</p>		This activates the service level.
<p> Turn the dial until "DHW" appears.</p>		
<p> Press and release button.</p>		The first menu item "DHW" is displayed.
<p> Rotate dial until "Circulation off during DHW heating" appears.</p>		
<p> Press/hold down.</p>		The value (in this case yes) flashes.
<p> Rotate dial.</p>		Set the desired value, in this case no.
<p> Release to save the input.</p>		
<p> Press.</p>		Return to next higher level.

	Input range	Factory setting	own input
Circulation off during DHW heating	yes/no	yes	

## 3.8 DHW monitor data


The "DHW" monitor menu can be used to display data for DHW settings.


The displays depend on the settings that have been selected in the "DHW" function.


Action	Display	Notes/instructions
<p>Calling up the service level</p>  <p>Press and release the buttons simultaneously.</p>		<p>This activates the service level.</p>
 <p>Turn the dial until "DISPLAY" appears.</p>		
 <p>Press and release button.</p>		<p>The first menu item "boiler" is displayed.</p>
 <p>Turn the dial until "DHW" appears.</p>		
 <p>Press and release button.</p>		

### Temperature

The calculated nominal value and measured value for the DHW temperature are displayed.

 Rotate dial to scroll through the DHW monitor data.

 Rotate dial to scroll through the DHW monitor data.

 Rotate dial to scroll through the DHW monitor data.

 Press.

DHW MONITOR	
loading	off
circulation 1	on

DHW MONITOR	
Sensor ON	50/48
Sensor OFF	55/30
H/E sensor	60/60

DHW MONITOR	
Primary pump	80 %
Secondary	100 %
Mixer	100 %

**possible modes:**

- off,
- continuous operation,
- automatic night,
- automatic day,
- vacation,
- optimization,
- disinfection,
- heating.

**Optimizer**

shows the time at which the system switches to DHW mode before the actual switching point to reach the DHW nominal value at the right time.

**heating**

shows operating status of DHW loading pump.

**DHW Circulation**

shows operating status of circulation pump.

**ON = sensor tank - center**

**OFF**

**H/E = sensor heat exchanger**

The mixer position shows a value between 0 % (closed) and 100 % (open).

Return to next higher level.

## 4 Troubleshooting

Fault	Effect on control characteristics	Possible causes of fault	Remedy
DHW sensor	<ul style="list-style-type: none"> <li>– No domestic hot water is produced.</li> </ul>	<ul style="list-style-type: none"> <li>– Sensor incorrect or not connected or faulty.</li> <li>– Module or control faulty.</li> </ul>	<ul style="list-style-type: none"> <li>– Check sensor connection.</li> <li>– Replace sensor or module.</li> <li>– Check sensor attachment on DHW tank.</li> </ul>
DHW warning	<ul style="list-style-type: none"> <li>– Continuous attempts to heat DHW tank.</li> </ul>	<ul style="list-style-type: none"> <li>– Temperature control/hand switch is not set to "AUT".</li> <li>– Sensor not correctly connected or faulty.</li> <li>– Sensor layout is incorrect.</li> <li>– Loading pump not correctly connected or faulty.</li> <li>– Module or control faulty.</li> </ul>	<ul style="list-style-type: none"> <li>– Check that temperature control or hand switch is set to "AUT".</li> <li>– Check function of sensor and loading pump.</li> <li>– Replace module.</li> <li>– Check sensor attachment on DHW tank.</li> </ul>
DHW is cold	<ul style="list-style-type: none"> <li>– No domestic hot water is produced. Current DHW temperature is below 40 °C.</li> </ul>	<ul style="list-style-type: none"> <li>– Loading pump faulty.</li> <li>– FM445 function module faulty.</li> <li>– More DHW is used than is heated.</li> </ul>	<ul style="list-style-type: none"> <li>– Check that temperature control or hand switch is set to "AUT".</li> <li>– Check function of sensor and loading pump.</li> <li>– Replace FM445 module.</li> <li>– Check sensor attachment on DHW tank.</li> </ul>
disinfection	<ul style="list-style-type: none"> <li>– Thermal disinfection was interrupted.</li> </ul>	<ul style="list-style-type: none"> <li>– Heat output of boiler is not sufficient, because other heat consumers (heating circuits) take heat during thermal disinfection.</li> <li>– Sensor not correctly connected or faulty.</li> <li>– Loading pump not properly connected or faulty.</li> <li>– Module or control faulty.</li> </ul>	<ul style="list-style-type: none"> <li>– Select thermal disinfection for a time at which no other heat is required.</li> <li>– Check sensor and loading pump function and replace if necessary.</li> </ul>
No master	<ul style="list-style-type: none"> <li>– Boiler protection is not guaranteed.</li> <li>– DHW priority no longer possible.</li> <li>– It is calculated with a minimum outside temperature.</li> <li>– It becomes cold.</li> </ul>	<ul style="list-style-type: none"> <li>– Master control (address 1) switched off or no master (address 1) present.</li> </ul>	<ul style="list-style-type: none"> <li>– Check the addresses of all bus devices. The master control must have address 1 (dial coding switch behind MEC2 at CM431 of the control).</li> <li>– Check bus connection at address 1.</li> </ul>

Tab. 1 Fault table

Fault	Effect on control characteristics	Possible causes of fault	Remedy
Incorrect module x	– All outputs are switched off from the module and the corresponding error LED is switched on.	– Incorrect module selected in MEC2. – Incorrect module installed in control. – The MEC2, the corresponding module or the control is faulty.	– Check the module defaults in the MEC2 service level. – Check the modules installed in the control. – Replace the MEC2 or the module.
Unknown module x	– All outputs are switched off from the module and the corresponding error LED is switched on.	– The module or control is faulty.	– Replace the module.
Inert anode	– No effects on control characteristics.	– Voltage is applied at the external input WF 1/2. – The module or control is faulty.	– Replace the inert anode.
External fault input	– No effects on control characteristics.	– A voltage is applied at the external input WF1/2. – The module or control is faulty.	– Check function of external components (tank loading pump or circulation pump) and replace if necessary.
DHW sensor WT	– No domestic hot water is produced.	– Sensor incorrect or not connected or faulty. – FM445 module or control faulty.	– Check sensor. – Replace sensor or FM445 module. – Check sensor attachment.
DHW sensor OFF	– No domestic hot water is produced.	– Sensor incorrect or not connected or faulty. – FM445 module or control faulty.	– Check sensor. – Replace sensor or FM445 module. – Check sensor attachment.

Tab. 2 Fault table

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