

Assembly and operating instructions

REMKO fresh water station Controller EFS

Instructions for user and specialist





Read these operating instructions carefully before commissioning / using this device!

These instructions are an integral part of the system and must always be kept near or on the device.

Subject to modifications; No liability accepted for errors or misprints!

Installation and operating instructions (translation of the original)

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1 Safety and usage instructions

1.1 General safety notes

Carefully read the operating manual before commissioning the units for the first time. It contains useful tips and notes such as hazard warnings to prevent personal injury and material damage. Failure to follow the directions in this manual not only presents a danger to people, the environment and the system itself, but will void any claims for liability.

Keep this operating manual and the refrigerant data sheet near to the units.

1.2 Identification of notes

This section provides an overview of all important safety aspects for proper protection of people and safe and fault-free operation. The instructions and safety notes contained within this manual must be observed in order to prevent accidents, personal injury and material damage.

Notes attached directly to the units must be observed in their entirety and be kept in a fully legible condition.

Safety notes in this manual are indicated by symbols. Safety notes are introduced with signal words which help to highlight the magnitude of the danger in question.

DANGER!

Contact with live parts poses an immediate danger of death due to electric shock. Damage to the insulation or individual components may pose a danger of death.

DANGER!

This combination of symbol and signal word warns of a situation in which there is immediate danger, which if not avoided may be fatal or cause serious injury.

WARNING!

This combination of symbol and signal word warns of a potentially hazardous situation, which if not avoided may be fatal or cause serious injury.

CAUTION!

This combination of symbol and signal word warns of a potentially hazardous situation, which if not avoided may cause injury or material and environmental damage.

NOTICE!

This combination of symbol and signal word warns of a potentially hazardous situation, which if not avoided may cause material and environmental damage.



This symbol highlights useful tips and recommendations as well as information for efficient and fault-free operation.

1.3 Personnel qualifications

Personnel responsible for commissioning, operation, maintenance, inspection and installation must be able to demonstrate that they hold a qualification which proves their ability to undertake the work.

1.4 Dangers of failure to observe the safety notes

Failure to observe the safety notes may pose a risk to people, the environment and the units. Failure to observe the safety notes may void any claims for damages.

In particular, failure to observe the safety notes may pose the following risks:

- The failure of important unit functions.
- The failure of prescribed methods of maintenance and repair.
- Danger to people on account of electrical and mechanical effects.

1.5 Safety-conscious working

The safety notes contained in this manual, the existing national regulations concerning accident prevention as well as any internal company working, operating and safety regulations must be observed.

1.6 Safety instructions for the operator

The operational safety of the units and components is only assured providing they are used as intended and in a fully assembled state.

- The units and components may only be set up, installed and maintained by qualified personnel.
- The existing regulations concerning accident prevention must be adhered to.
- Do not operate units or components with obvious defects or signs of damage.
- Contact with equipment parts or components can lead to burns or injury.
- Ensure that electrical energy does not pose a risk.
- Regulations of the VDE and the local energy supply company must be adhered to.

! NOTICE!

Material damage due to mineral oils!

Mineral oil products permanently damage EPDM seal elements; the sealing properties may therefore be lost. We do not take responsibility or provide warranty replacements for damage caused by seals that are damaged in this way.

- It is essential that you prevent EPDM from coming into contact with mineral oil substances.
- Use a lubricant that is free of mineral oil and has a silicone or polyalkylene basis, such as Unisilikon L250L and Syntheso Glep 1 made by Klüber, or a silicon spray.

1.7 Safety notes for installation and inspection tasks

- The operator must ensure that all inspection and installation work is carried out by authorised and qualified personnel who have thoroughly read the operating manual.
- Works on the pump/system may only be carried out whilst at a standstill as a matter of principle.
- Appropriate hazard prevention measures must be taken to prevent risks to people when performing installation, repair, maintenance or cleaning work on the units.
- The setup, connection and operation of the units and its components must be undertaken in accordance with the usage and operating conditions stipulated in this manual and comply with all applicable regional regulations.
- Regional regulations and laws as well as the Water Ecology Act must be observed.
- The power supply should be adapted to the requirements of the units.
- The units and components must be kept at an adequate distance from flammable, explosive, combustible, abrasive and dirty areas or atmospheres.
- Safety devices may not be modified or bypassed.

! NOTICE!

Malfunction!

The fresh water module must be integrated into the equipotential bonding system of the electrical installation. If this is not ensured by the pipe network, set up an approved potential equalisation connection to the main potential connection.

1.8 Unauthorised modification and changes

The operational safety of the fresh water module that was delivered is guaranteed only with intended use in accordance with section 1.8 of the operating instructions. Under no circumstances should the threshold values specified in the data-sheet be exceeded.

Modifications or changes to units and components are not permitted and may cause malfunctions. Safety devices may not be modified or bypassed. Original replacement parts and accessories authorised by the manufacturer ensure safety. The use of other parts may invalidate liability for resulting consequences.

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1.9 Intended use

The fresh water controller, subsequently referred to as the controller, is an independent, mounted electronic temperature controller for assembly and installation. Integration in a pump group is possible if the technical data of the controller is complied with. The maintenance-free controller is provided exclusively for controlling and monitoring a REMKO fresh water station. Use only REMKO accessories in conjunction with the controller.

Any different or additional use is a non-intended use. The manufacturer/supplier assumes no liability for damages arising from a non-intended use. The user bears the sole risk in such cases. Intended use also includes working in accordance with the operating and installation instructions and complying with the maintenance requirements.

The threshold values specified in the technical data must not be exceeded.

1.10 Safety-conscious working

The safety notes contained in this manual, the existing national regulations concerning accident prevention as well as any internal company working, operating and safety regulations must be observed.

1.11 Warranty

For warranty claims to be considered, it is essential that the ordering party or its representative complete and return the "certificate of warranty" to REMKO GmbH & Co. KG at the time when the units are purchased and commissioned.

The warranty conditions are detailed in the "General business and delivery conditions". Furthermore, only the parties to a contract can conclude special agreements beyond these conditions. In this case, contact your contractual partner in the first instance.

1.12 Transportation and packaging

The units are shipped in sturdy transport packaging or within the heat pump housing. Immediately check the units on delivery and make a note of any damage or missing parts on the delivery note. Inform the forwarding agent and contractual partner. Claims under guarantee made at a later date will not be accepted.



WARNING!

Plastic films and bags etc. are dangerous toys for children!

Why:

- Leave packaging material are not around.
- Packaging material may not be accessible to children!

1.13 Environmental protection and recycling

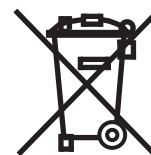
Disposing of packaging

All products are packed for transport in environmentally friendly materials. Make a valuable contribution to reducing waste and sustaining raw materials. Only dispose of packaging at approved collection points.



Disposing of the units and their components

For the manufacture of the units and components, only recyclable materials have been used. Help protect the environment by ensuring that the units or components (for example batteries) are not disposed of in household waste, but only in accordance with local regulations and in an environmentally safe manner, e.g. using authorised disposal and recycling specialists or council collection points.



2 Technical data

2.1 Unit data

Series		EFS
Inputs/outputs		
Rated voltage (system voltage)	V / Hz	115... 230V / 50/60 Hz
Energy consumption	W	≤ 0.8 W, two Pt1000 temperature probes connected
Outputs R1, R2 - number		2
Type		Triac
Switching current		2.0 (2.0) A
Voltage		115... 230V / 50/60 Hz
L _{const} - Switching current		2.0 (2.0) A
Voltage		115... 230V / 50/60 Hz
Total - Switching current		4.2 (4.2) A
Voltage		115... 230V / 50/60 Hz
Signal inputs/outputs		
Signal inputs 1 ... 5 - Number		5
Type of signal inputs 1 ... 4		Pt1000 (temperature detection)
Type of signal input 5		Bus communication for cascading
Signal output R _S type		Potential-free NO contacts
Maximum contact rating		1 (0) A, 24 V
Signal outputs PWM R1, PWM R2 - type		PWM, 250 Hz, 11 V; Characteristics: 0 % PWM = Pump off 100 % PWM = Maximum speed
Maximum load capacity		10 mA
Hydraulic variants		
Number		5
Display		
Type		LCD with background illumination
Operating conditions		
Enclosure class		IP 22, DIN 40050 [without front panel: IP 20]
Protection class		I
Ambient temperature	°C	0 ... +50 °C for free wall mounting

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Unit data (continued)

Series		EFS
Physical values		
Dimensions L x W x H	mm	110 x 160 x 51
Weight	g	350
Software class		A
Mode of operation		Type 1.Y
Fastening method for permanently-connected lines		Type X
Degree of contamination		2
Temperature of the ball pressure check		Housing walls: 125 °C Remaining housing parts: 75 °C
Overvoltage category		Class II (2500 V)

2.2 Cable specification



Mains cable		
Mains power supply type		H05 VV-... (NYM...)
Outer diameter of jacket		6.5 mm to 10 mm
Single wire cross section (rigid)		≤ 2.5 mm ²
finely-stranded (with wire end sleeves)		≤ 1.5 mm ²
Diameter of the internal strain relief	mm	6.5 to 10
Signal cable		
Length of probe cable	m	≤ 100 m, including extension
Extension cable for probe configuration		Wires twisted in pairs for length > 10 m 0.75 mm ² for length < 50m
Cross-section per conductor		1.5 mm ² for length > 50 m

3 Unit construction

3.1 Housing



Fig. 1: Front view of the controller

No.	Element	See
1	Operating mode button  (below the front panel)	
2	Buttons △, SET, ESC, ▽	
3	Display	 on page 9
4	Front panel	
5	Terminal cover	1)
6	Fastening screw for the terminal cover	

1) You can find the description of the connection terminals under the terminal cover here.

3.2 Display

Overview

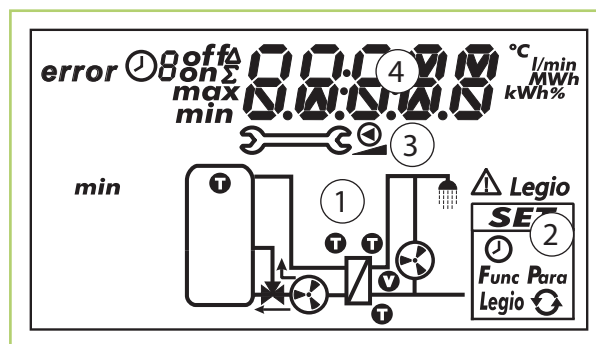











Fig. 2: Overview over the areas of the display (all elements visible)

1	System diagram
2	Setting menu
3	Pictograms for functions
4	Operating and setting values

The areas of the display are described below.

Symbols of the system diagram

The table below describes the symbols in the system diagram (no. 1 in Fig. 2).

Symbol	Description
	Pipe
	External heat exchanger
	Domestic hot water extraction point
	Storage tank
	3-way valve with flow direction specified
	Pump, switched on
	Pump, switched off
	Temperature sensor
	Medium flow rate probe

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Setting menu

The setting menu (no. 2 in Fig. 2) contains the following entries:

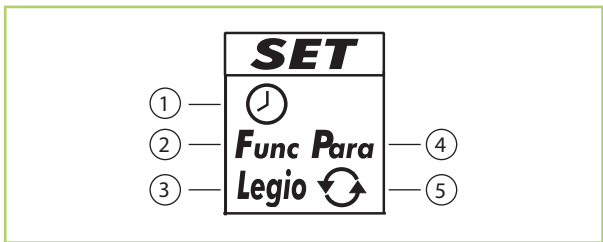





Fig. 3: Setting menu

- 1: Time
- 2: Functions
- 3: Thermal disinfection
- 4: Domestic hot water target temperature
- 5: Reset to factory setting

Pictograms for functions

The table below describes the pictograms for functions (no. 3 in Fig. 2).

Symbol	Description
	Manual mode
	Pump is controlled with speed regulation ¹⁾
	Alarm output ¹⁾
<i>Legio</i>	Thermal disinfection ¹⁾

¹⁾ The symbol is visible as long as the function/the parameter is being edited in the setting menu.

Operating and setting values

The display of the operating and setting values (no. 4 in Fig. 2) consists of the following elements:

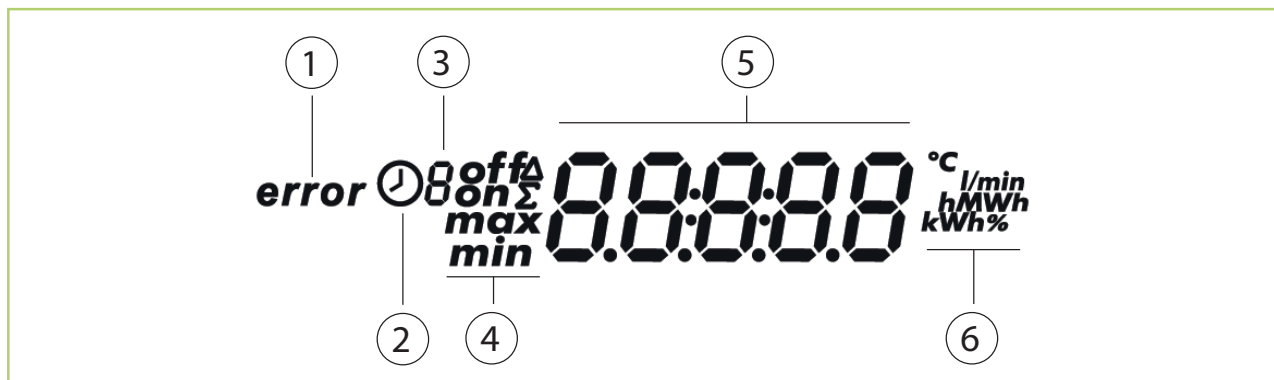


Fig. 4: Display of operating and setting values

1	This symbol is displayed if an error occurs
2	Symbol for time control of functions. This symbol is displayed if: <ul style="list-style-type: none"> • a time limit/time control is set • the status of the time limit/time control is displayed • the time limit blocks a temperature control (symbol flashes)
3	Number of the time window that is currently set/displayed in the setting menu or that actually includes the current time. The time control of a functions consists of 1 or 3 time windows that can be set. Example: Time window 1: 06:00 - 08:00 Time window 2: 11:00 - 12:30 Time window 3: 17:00 - 19:00
4	Additional information: On, off: Switching status/switching condition on, off max, min: maximum value, minimum value Σ: cumulative operating value since initial commissioning, cannot be reset Δ: cumulative operating value since the last reset to 0
5	Display of: <ul style="list-style-type: none"> • Measured values • Set values • Error codes • Additional information, e.g. software version
6	Physical unit of the value displayed in no. 5: °C, l/min, %, h, kWh, MWh

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4 Operation

4.1 Buttons and Display

This section contains general information about operating the controller.

Buttons

Operation takes place using the \triangle , ∇ , SET, ESC and \hookrightarrow buttons as follows:

\triangle	<ul style="list-style-type: none">• Scrolls up in the menu• Increases the setting value by 1 level)
∇	<ul style="list-style-type: none">• Scrolls down in the menu• Reduces the set value by 1 level
SET	<ul style="list-style-type: none">• Selects a set value to be changed (setting value flashes)• Confirms a set value or moves down one menu level• Calls the set menu (not in manual mode)
ESC	<ul style="list-style-type: none">• Discards a setting• Moves up one operating level
\hookrightarrow	Sets the operating mode



We recommend noting changed settings in writing.

Display during operation

- A component flashing in the system diagram means the following: The operating value or setting value that is displayed applies to the flashing components. Exception: \hookrightarrow It always flashes in manual mode.
- Displays that are automatically alternating are shown overlapping in the figures. Example: Fig. 6.

4.2 Operating modes

Change operating mode

! NOTICE!

Danger of damage to the pump due to dry running. Switch on the manual and automatic operating modes only if the system is filled.

- Remove the front panel.
- Press the \hookrightarrow button for 2 seconds to change the operating mode.
- Repeat step 2 if required.
- Attach the front cover.

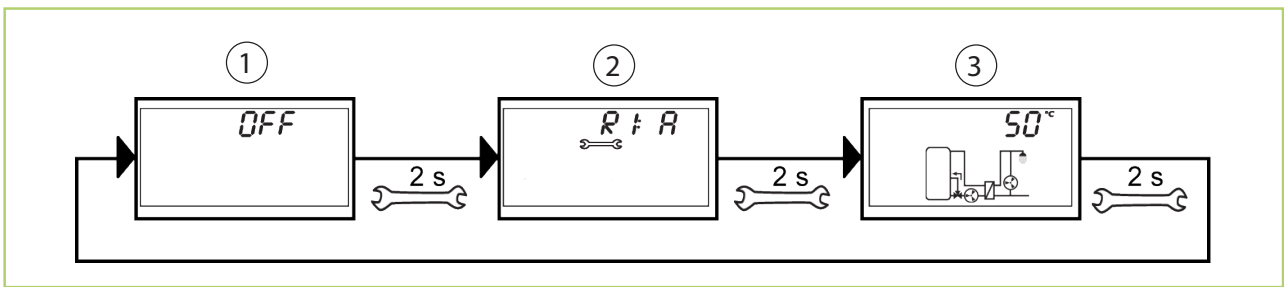


Fig. 5: Change operating mode

- 1: Off
2: Manual mode
3: Automatic

Operating mode off

Method of operation

- All outputs are switched off (outputs/control outputs switched off, relay open)

DANGER!

The pump lines are still powered because these are constantly supplied with 230 V

- "OFF" and the software version are displayed alternating. Example in Fig. 6: Software version St 1.3
- The background lighting is red
- The variant display can be called (see Fig. 6)

Operation

1. ➔ Press "SET" to call the display of the pre-set Friwa variant.

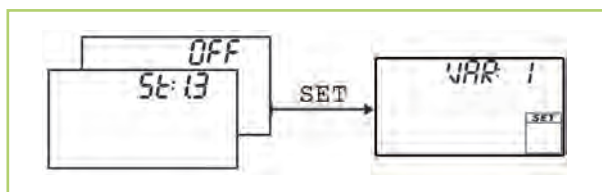


Fig. 6: Operating mode off - operation


2. ➔ Press the "△" and "▽" buttons at the same time for 2 seconds, in order to access variant selection. The pre-set REMKO factory setting is for the EFS 25 variant 02, for the EFS 35 variant 04 and for the EFS 50 variant 10.

! NOTICE!

The variant may only be changed by a specialist. Otherwise, we cannot guarantee that the Controller will function correctly after changing the variant.

Manual operating mode

Method of operation

- The background lighting is red, the open-end wrench symbol  flashes.
- The outputs of the controller (pumps, valves) can be switched manually.
Possible switching statuses:
0: Off
1: On
0% ... 100%: Control the HE pump via PWM (only H1, H2)
A: Automatic operation in accordance with the settings in the settings menu
- The current temperatures and operating hours can be displayed (status display).
- The Display of the hot water temperature shows a value that is not smoothed.
- When switching to manual operation, all outputs are set to A, R1 is displayed.
- Typical use: Function test (maintenance), troubleshooting.

Operation

You can switch the outputs on and off as follows:

1. ➔ If necessary, press "△ ▽" to select a different output.
2. ➔ Press "SET". The switching status flashes.
3. ➔ Press "△ ▽" to change the switching status.
4. ➔ Press "SET" to apply the change.

Also see (2) in the next figure.

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You can display the current temperature and operating hours as follows:

1. ➤ Press "ESC". The temperature/operating hours value is displayed, the corresponding component flashes (③), the display is not shown).
2. ➤ Press " $\Delta \nabla$ " to select a different component.
3. ➤ Press "SET" to exit the display of the temperature/operating hours value.

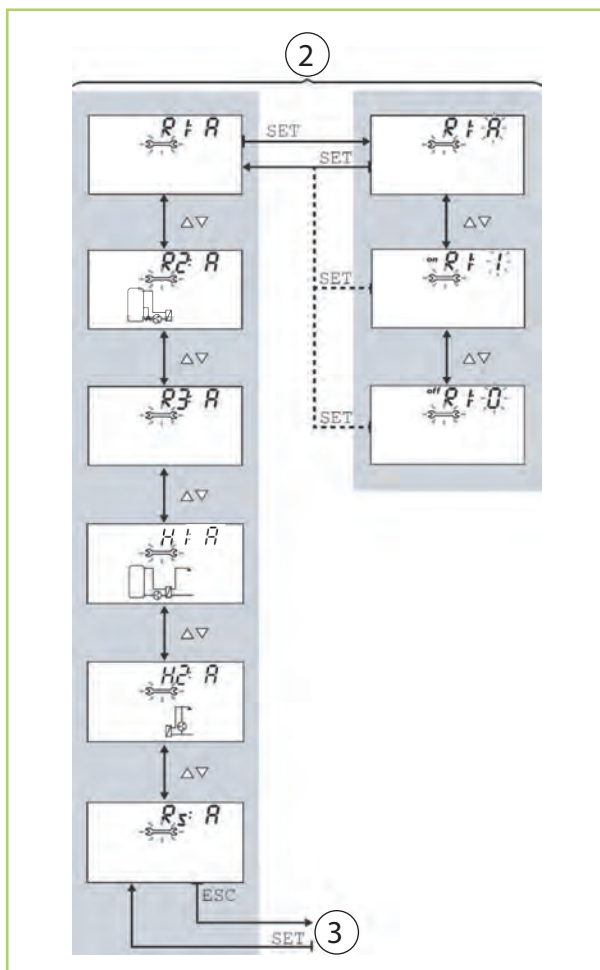


Fig. 7: Manual operating mode - operation

Automatic operating mode

Method of operation

Automatic operating mode is pre-set in the delivered state. Automatic is the normal operating mode, the system is controlled automatically. The following actions are possible:

- Display status (status display): Display status of external components (temperatures, switch statuses, running times) ④
- Display the saved minimum and maximum values (temperature probe) or the cumulative/difference values (operating hours¹⁾ of the pumps and valves) ⑤
- Cumulative values (Σ symbol): Operating hours since initial commissioning. Cumulative values cannot be reset.
- Difference values (Δ symbol): Operating hours since the last reset to 0
- Reset the saved minimum/maximum/difference values ⑥
- Call the setting menu ⑦

¹⁾ Cumulative switch on times for the outputs

Operation

✓ The controller is in the status display.

You can display and reset the saved minimum/maximum/difference values as follows:

1. ➤ If necessary, press " $\Delta \nabla$ " to display a different component (4, component flashes).
2. ➤ Press "SET". The minimum/maximum/difference values are displayed alternately (5).
3. ➤ If necessary, press "SET" for 2 seconds to reset the value that is **currently (!)** displayed (6).
4. ➤ Press "ESC". The status display is displayed.
5. ➤ Repeat steps 1 to 4 if required.

You can display the status of external components as follows:

Press " $\Delta \nabla$ " to display the status of a different component (4).

You can call the setting menu as follows:

Press "SET" for 2 seconds (7). The setting menu is displayed.

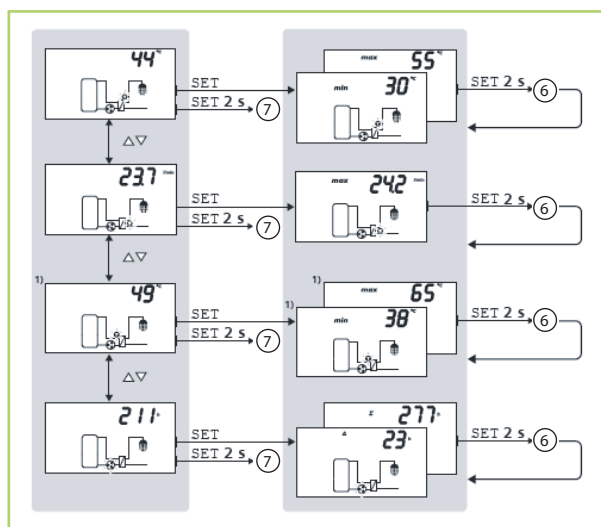
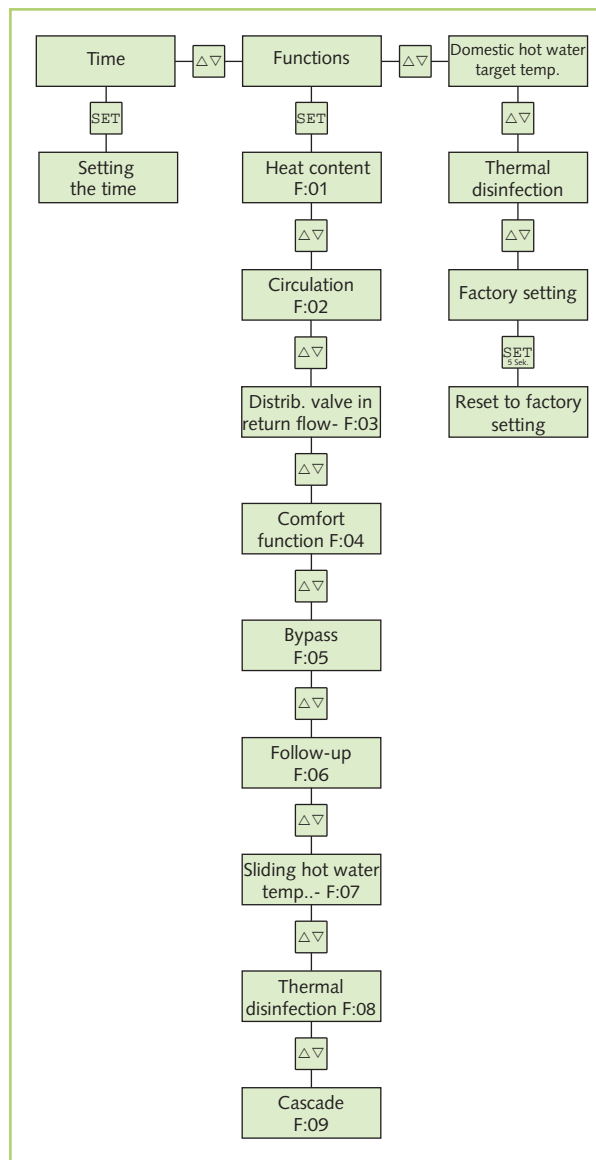


Fig. 8: Automatic operating mode - operation

4.3 Setting menu

Overview

The diagram below provides an overview of the structure of the setting menu.




Call the setting menu and select the menu entry

✓ "Automatic" or "Off" operating mode is selected.

1. ➤ Press "SET" for two seconds. The setting menu is displayed, the menu entry ⑦ flashes.
2. ➤ Press " $\Delta \nabla$ " to select a different menu entry.
3. ➤ Change the settings as described in the following sections.

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Setting the time

✓  flashes.

1. ➤ Press "SET". The hour flashes.
2. ➤ Press "△▽" to set the hour.
3. ➤ Press "SET". The minute flashes.
4. ➤ Press "△▽" to set the minute.
5. ➤ Press "SET".
6. ➤ Repeat steps 4 and 5 to set the year, month and date.

Set functions

✓ *Func* flashes.

Proceed as described in  Chapter 4.4 'Functions' on page 16.

Set the domestic hot water target temperature

Method of operation

The controller attempts to regulate the hot water temperature to the set value. The hot water temperature can be changed within the following limits:


Minimum: 20 °C

Maximum: 90 °C

Factory setting: 50 °C

Operation

✓ *Para* flashes.

1. ➤ Press "SET". The domestic hot water target temperature is displayed, the corresponding component  in the system diagram flashes (Fig. 9).
2. ➤ Press "SET". The temperature value flashes.
3. ➤ Press "△▽" to change the value.
4. ➤ Press "SET", the change is applied.

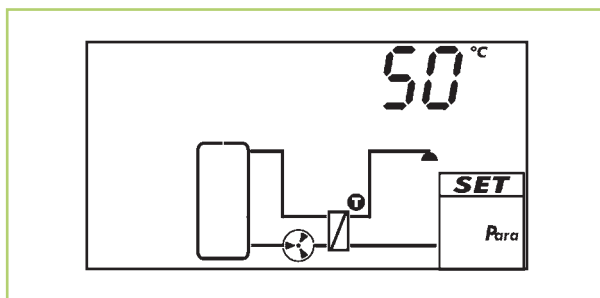



Fig. 9: Set the domestic hot water target temperature

Switch on thermal disinfection

Method of operation

If required, the fresh water module provides higher domestic hot water temperatures, in order to kill dangerous germs. At the same time, the circulation pump is activated, as long as the circulation function was activated. If the circulation function was not activated, only the domestic hot water target temperature is increased to the disinfection temperature. Thermal disinfection is started via the setting menu. After a manual start, thermal disinfection must be stopped again manually. For safety reasons, thermal disinfection is deactivated after one hour of running time if it was started manually.



Detailed settings for thermal disinfection must be made in the corresponding function (F:08), see  'Thermal disinfection' on page 22.



In cascade operation, the master controller releases both modules during the disinfection period.

Operation

✓ The "Thermal disinfection (F:08)" function was activated, see the "Thermal disinfection" section. Otherwise, "----" is displayed. ✓ *Legio* flashes.

1. ➤ "StArt" is displayed.
2. ➤ Press "SET". "oFF" is displayed.
3. ➤ Press "SET". "oFF" flashes.
4. ➤ Press "△▽". "on" and  *Legio* flash.
5. ➤ Press "SET". The changes are applied.  *Legio* flashes. The controller remains in the Legio menu until thermal disinfection is deactivated manually.

Reset to factory setting

✓  flashes, "RESEt" is displayed.

1. ➤ Press "SET" for 5 seconds.
2. ➤ After a short running display, the controller switches to "Automatic" operating mode.

4.4 Functions

General information for operating the functions

Display functions

When displaying the functions, the following information is visible:

- Function number, e.g. F:01 (Fig. 10)
- Switching status:
 - "on": Function is activated
 - "off": Function is deactivated (Fig. 10)



If the function is not displayed or if neither on nor off are displayed, the function cannot be used.

Possible reasons:

- The system set does not allow the function
- All outputs are occupied

You can display the functions as follows:

✓ *Func* flashes.

1. ➤ Press "SET". F:01 flashes.
2. ➤ Press "△ ▽" to display the next function.

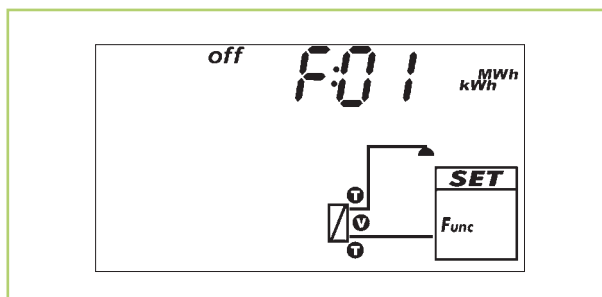


Fig. 10: Display functions

Activate function

In order to be able to use a function, it must be activated (activation = "on") and its key variables must be fully set. If the function is activated and exited before all required key variables are set, "oFF" flashes for a short time (Fig. 11). The function is then displayed with the switching status "oFF" (function is deactivated).

You can activate a function as follows:

✓ Function number flashes.

1. ➤ Press "SET". The function is selected and flashes.
2. ➤ Press "SET". "oFF" is displayed.
3. ➤ Press "SET". "oFF" flashes.
4. ➤ Press "△ ▽". "on" flashes.
5. ➤ Press "SET". The function is activated.
6. ➤ Set the key variables as described below.

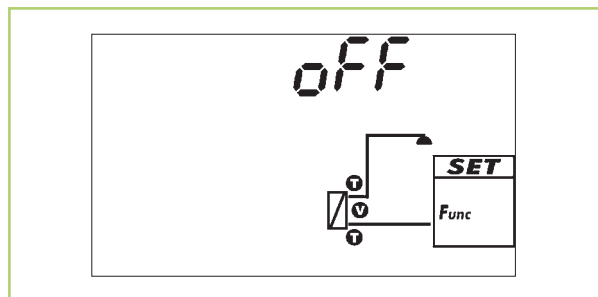


Fig. 11: Activate function

Set key variable

The functions have a different number of key variables. The value of a key variable is always set with the same operating steps.

You can set the value of a key variable as follows:

✓ The function was activated as described above.

1. ➤ Press "△ ▽" to select the key variable.
2. ➤ Press "SET". The value of the key variable and the corresponding component flash in the system diagram.
3. ➤ Press "△ ▽" to change the value.
4. ➤ Press "SET" to apply the change.
5. ➤ Repeat steps 1 to 4 for further key variables.
6. ➤ Press "ESC" when all key variables of the function are set. The function number flashes.

Key variables

The following describes important key variables of the functions. The figures show examples.

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Temperature control

If a function is to be controlled by temperature, the temperature control must be switched on (tc = temperature control). In the Fig. 12, the temperature control is activated ("on").

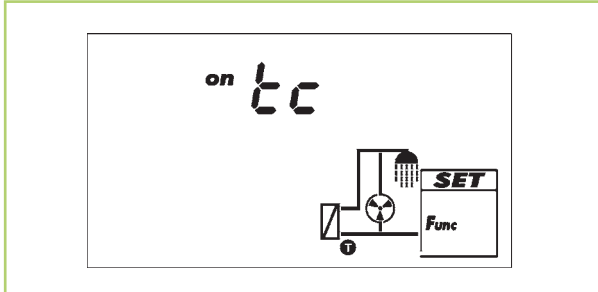


Fig. 12: Key variable for temperature control

Clock control

If a function is to be controlled by time, the clock control must be switched on and the time window set (cc = clock control). In the Fig. 13, the clock control is activated ("on").

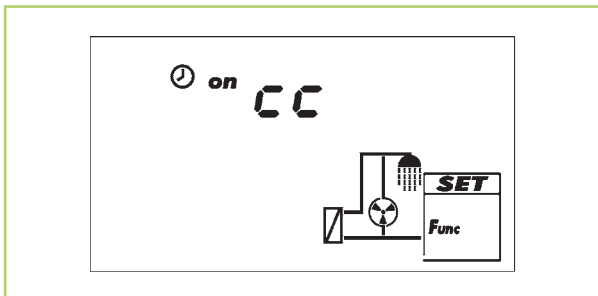


Fig. 13: Key variable of clock control

Start time of a time window

When setting the start time of a time window, the following is displayed to the left of the start time (see Fig. 14):

- ⌚
- Number of time window 1 ... 3, its start time was set (here: 1)
- "on"

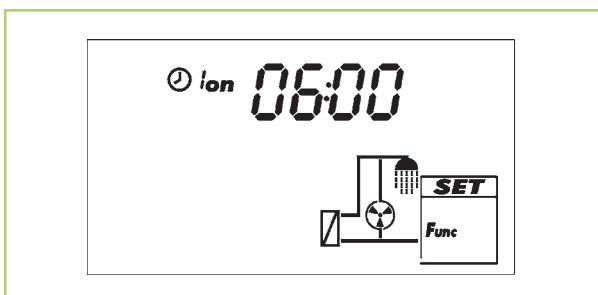


Fig. 14: Key variable of time window start

End time of a time window

When setting the end time of a time window, the following is displayed to the left of the end time (see Fig. 15):

- ⌚
- Number of time window 1 ... 3, its end time was set (here: 1)
- "off"

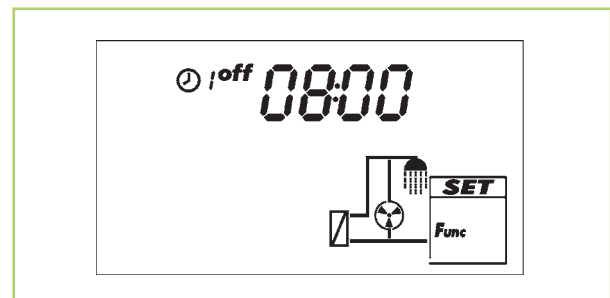


Fig. 15: Key variable of time window end



The start time is always before the end time! If you attempt to set the start time to later than the end time, the end time is automatically pushed back.

Flow control

If a function is to be controlled by flow, the flow control must be switched on (Fc = flow control). In the Fig. 16, the flow control is activated ("on").

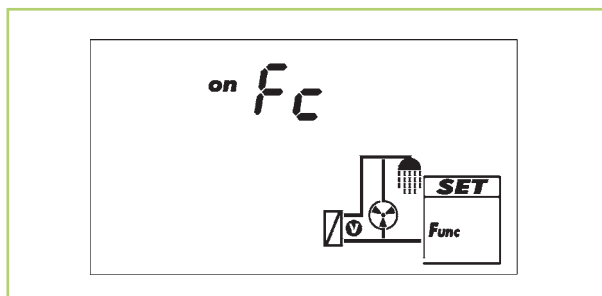


Fig. 16: Key variable of flow control

Speed control for the circulation pump

If a function is to be controlled by speed, the speed of the circulation pump must be set.

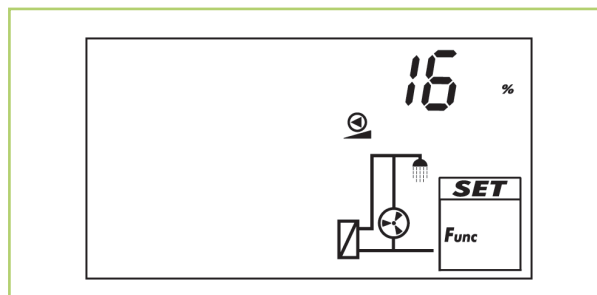


Fig. 17: Key variable for speed control of pump

Function descriptions

The tables in this section describe the key variables of the functions as follows:

- The rows contain the key variables in the same sequence as they appear on the display.
- The columns contain the following information from left to right:

Column	Description
Display	Example for the display when setting the key variables.
Key variable	<p>Descriptions of the key variables and their dependencies to each other. Dependent key variables can only be selected and set if the higher-level key variable has the value "on". This is displayed as follows:</p> <ul style="list-style-type: none"> ■ Higher-level key variable: Bold font ■ Dependent key variables: Below the higher-level key variable and indented to the right <p>Example: In the table of the circulation function, the probe input, switch-on temperature and switch-off temperature key variables are only displayed if the temperature control has the value "on".</p>
minimum, maximum, factory setting	The lower (minimum) and upper (maximum) limits of the value range of a key variable, as well as the factory setting. If a value range only contains a few values, these are specified individually. Example: "on", "oFF".

Heat content

Calculates the heat content determined using the following key variables:

- Hot water temperature, secondary
- Cold water temperature, secondary
- Medium flow rate, secondary

No further settings are required. The function can only be activated or deactivated.

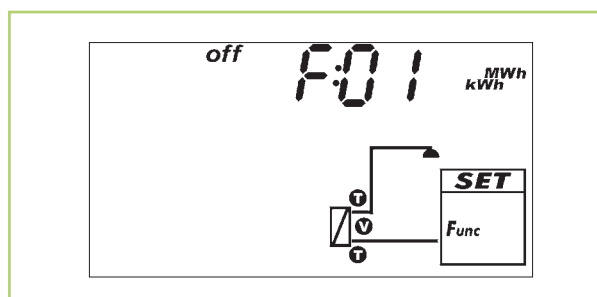


Fig. 18: Calculating heat content

Measured value display: The measured values are displayed in the status menu. The current performance and the daily heat content are displayed after the fresh water values.

REMKO fresh water station Controller

Current thermal performance: The corresponding maximum value is displayed when "SET" is pressed.

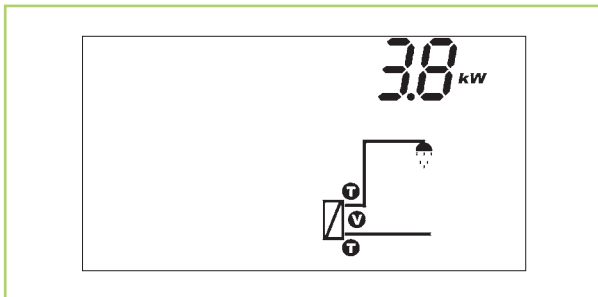


Fig. 19: Current thermal performance, maximum value

Daily heat content: When "SET" is pressed, the total heat content and the daily heat content are displayed alternately.

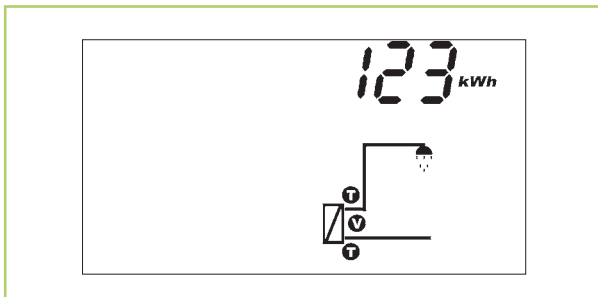


Fig. 20: Display of total heat content and daily heat content



In cascade operation, each controller displays its "own" calculated heat content.

Key variable	min.	max.	Factory setting
Activation	on, oFF		on

Circulation

Switches a circulation pump that is controlled by temperature, clock and/or flow on and off. The three control modes can be combined in any way.

Temperature control: If the temperature on the circulation return falls below the T_{on} value, the circulation pump is switched on until the temperature reaches the T_{off} value. The temperature control is time-limited if the clock control is activated.

Clock control: If the current time is within one of 3 time windows that can be set, the circulation pump is:

- Permanently switched on if the temperature control is deactivated ("oFF")
- Controlled by temperature if the temperature control is activated ("on")

Flow control: Flowing for a short time (<5s) switches the circulation pump on for the duration of activation. After the duration of activation expires, the circulation pump remains switched off at least for the duration of the waiting time. The flow control works independent of the clock control.

Key variable	min.	max.	Factory setting
Activation	on, oFF		oFF
Speed regulation	0%	100%	40%
Temperature control (tc)	on, oFF		oFF
Activation temperature T_{on}	0 °C	$T_{off} - 2 \text{ K}$	30 °C
Deactivation temperature T_{off}	$T_{on} + 2 \text{ K}$	95 °C	35 °C
Clock control (cc)	on, oFF		oFF
Day	day: 1 to day: 7		-
Time window 1 start/end	0:00	23:59	6:00/8:00
Time window 2 start/end	0:00	23:59	12:00/13:30
Time window 3 start/end	0:00	23:59	18:00/20:00
Flow control (fc)	on, oFF		oFF
Duration of activation	1 min	10 min	2 min
Waiting time	0 min	60 min	10 min

Distribution valve in return flow

Switches the distribution valve in the return flow on. The cold water probe is pre-defined at output R2.

No further settings are required.

The function can only be activated or deactivated.

R2 on if $TKW \geq 28 \text{ °C}$

R2 off if $TKW \leq 23 \text{ °C}$

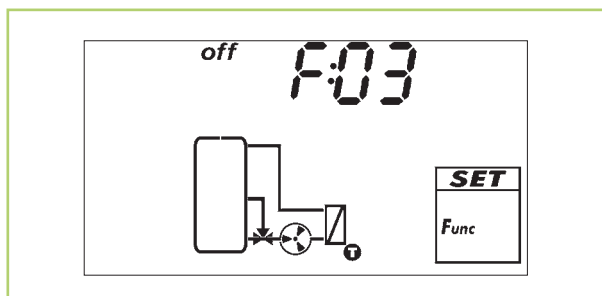


Fig. 21: Distribution valve in return flow

Measured value display: The measured values are displayed in the status menu. The temperature of the cold water probe and the operating hours of the distribution valve are displayed after the fresh water values.

Temperature of the cold water probe: The corresponding minimum/maximum value is displayed when "SET" is pressed.

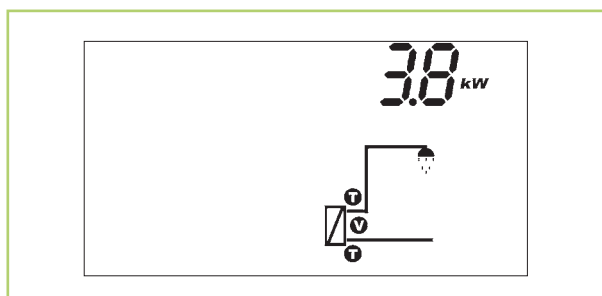


Fig. 22: Display of minimum/maximum value

Operating hours of the distribution valve: When "SET" is pressed, the delta value and the cumulative value of the operating hours are displayed alternately.

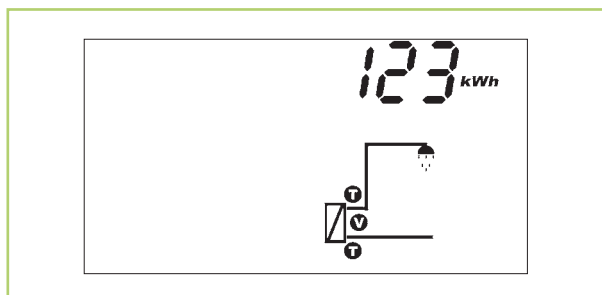


Fig. 23: Display of the delta value and the cumulative value of the operating hours



In cascade operation, this function may only be activated for the master controller. This function is blocked in the slave controller. The slave controller sends its cold water temperature to the master controller. If both stations are active, the higher cold water temperature is used as the switching value.

Key variable	min.	max.	Factory setting
Activation	on, oFF		oFF

Sliding hot water temperature

Adjusts the domestic hot water target temperature to the temperature level of the buffer tank for pre-heating systems that are discharged from the Buffer tank without re-heating ($T_{ww\ target} = T_{VL} - 5\ K$).

This function works according to fixed parameters. No further settings are required. If this function is active in operation, this is symbolised by a flashing temperature.

The function can only be activated or deactivated.

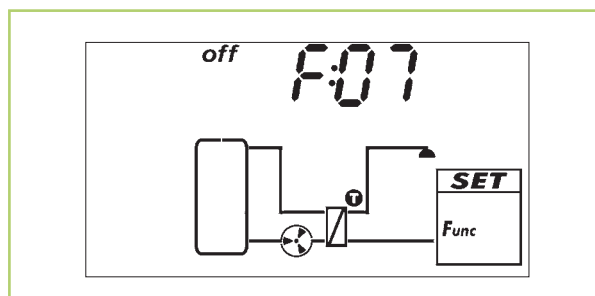


Fig. 24: Sliding hot water temperature



In cascading operation, this function is recommended only in exceptional cases because high temperature fluctuations occur at the dispensing connection when switching the modules. If the function is selected despite this, it must be activated in the master and slave controllers. The function works independently in each of the controllers.

Key variable	min.	max.	Factory setting
Activation	on, oFF		on

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Thermal disinfection

The fresh water station provides higher domestic hot water temperatures, in order to kill dangerous germs. At the same time, the circulation pump is activated, as long as the circulation function was activated. If the circulation function was not activated, only the domestic hot water target temperature in the defined time window is increased to the disinfection temperature.

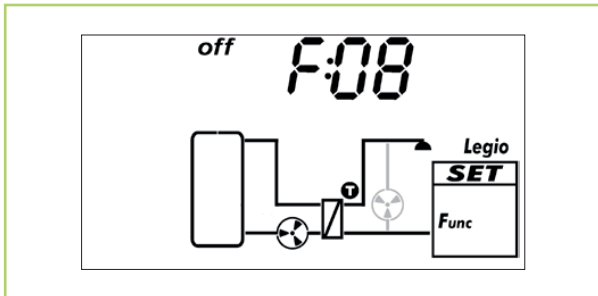


Fig. 25: Thermal disinfection

Only one time window per day is available for thermal disinfection.

Key variable	min.	max.	Factory setting
Activation	on, oFF		oFF
Disinfection temperature	60 °C	80 °C	73 °C
Clock control	on, oFF		on
Day	day: 1 to day: 7		-
Time window	0:00	23:59	01:00/02:00

Cascade

Controls cascade operation of two fresh water stations.

Both controllers are connected to each other via a communications bus. The connecting line is connected to both controllers at connections 5, 1. If the minimum cross-section is 0.25 mm², the length of the bus connection must not exceed 3 m. 2-way valves must be integrated into the cold water pipe and connected to R1. The circulation pump must be plugged into a combined circulation phase provided by the customer ahead of the two modules. Use only original REMKO accessories.

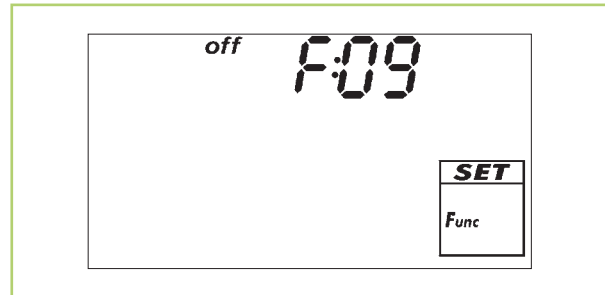


Fig. 26: Cascade

The cascade function must be activated in both controllers; one controller must be configured as the master (MA) and the other as the slave (SL).

The master controller forwards the following information to the slave:

- "Switch on" command
- "Switch off" command
- Domestic hot water target temperature
- Date and time

Key variable	min.	max.	Factory setting
Activation	on, oFF		oFF
Master / Slave	MA, SL		MA

Alarm output

Controls the set output for the following errors:

- Probe errors due to a short circuit or an interruption
- Medium flow rate errors: Er:1 ¹⁾
- Electronic overload check/fuse has been triggered: Er:2 ... Er:5 ¹⁾

¹⁾ more information in Chapter 8 'Troubleshooting and customer service' on page 30



The alarm output is always active

! NOTICE!

The signal output R_S may only be operated with low voltage up to 24 V and limited power.

4.5 Information messages

Display	Description
50°C Flashes	The sliding domestic hot water temperature is active.

5 Assembly and dismantling

! NOTICE!

The following section only describes the installation of the controller. When installing external components (valves etc.), follow the instructions provided by the relevant manufacturer.

Opening/closing the housing

Remove the front panel

- Grasp the front panel ① by the grip grooves on the side ② and pull it forwards ③ (Fig. 27).

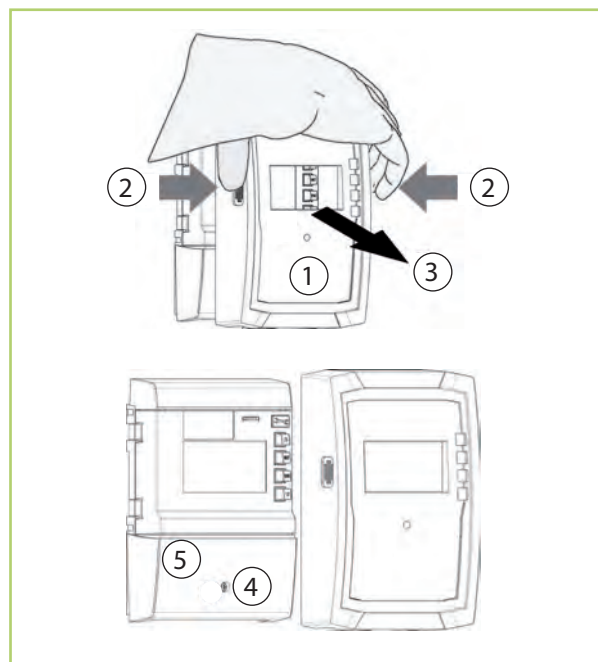


Fig. 27: Remove the front panel

- 1: Front panel
- 2: Grip grooves
- 3: Pull front panel forwards
- 4: Screw
- 5: Terminal cover

Attach the front cover

- Position the front panel ① carefully and press it onto the housing so that it clicks into place.

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Remove the terminal cover



DANGER!

Danger of death due to electric shock!

- Disconnect the controller from the power supply before removing the terminal cover.
- Ensure that the power supply to the open unit cannot be switched on inadvertently.

- Loosen the screw ④ (Fig. 27).
- Remove the terminal cover ⑤.

Attach the terminal cover

- Position the cover ⑤.
- Tighten the screw ④ with a torque of 0.5 Nm.

Mount the housing

The controller is firmly fitted. This section should be consulted only in service situations (changing the controller).

✓ The mounting location fulfils the required usage conditions; for more information, see .

✓ The mounting surface is vertical and enables free mounting in an easily-accessible position.



DANGER!

Danger of death due to electric shock!

- Before opening the housing, disconnect the controller from the power supply.
- Ensure that the power supply cannot be switched on inadvertently when the housing is open.
- Do not use the housing as a drilling template.

1. ➤ If required, remove the terminal cover.
2. ➤ Screw in the screw for the top mounting opening ① (Fig. 28) so that the screw head has a distance of 5 ... 7 mm to the mounting surface.
3. ➤ Hook the controller on to the screw at the top mounting opening and align it vertically.
4. ➤ Mark the bottom mounting opening ② through the controller housing.
5. ➤ Remove the controller and prepare the mounting hole for the bottom screw.
6. ➤ Hook the controller to the top mounting opening ① and fix it through the bottom mounting opening ② with the screw.
7. ➤ Attach the terminal cover.

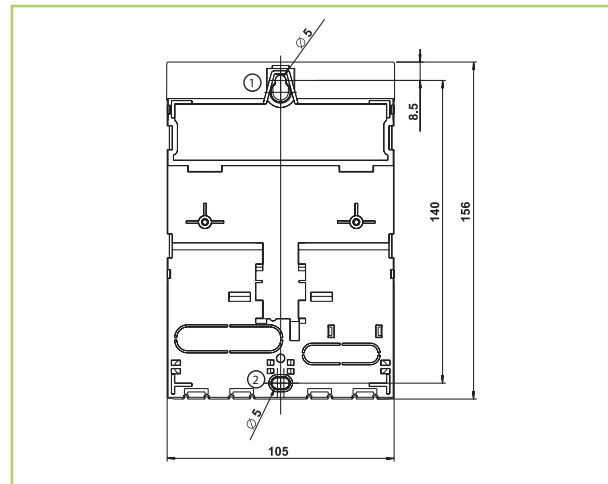



Fig. 28: Rear of the controller with the mounting openings at the top ① and bottom ②

Dismantling

DANGER!

Danger of death due to electric shock!

- Before opening the housing, disconnect the unit from the power supply.
- All work on the open unit may only be carried out by a specialist.

1. ➤ Dismantle the controller in the opposite sequence to that used for installation; for more information, see  *Chapter 5 'Assembly and dismantling' on page 23.*
2. ➤ Dispose of the electrical and electronic components of the system in accordance with the guidelines for old electrical and electronic equipment. If you have any queries, contact the local authorities responsible.

6 Electrical wiring

Set up electrical wiring

DANGER!

Danger of death due to electric shock!

Ensure that the following conditions are met when carrying out the works described in this section:

- During installation, all cables to the controller must be disconnected from the mains and cannot be inadvertently connected to the mains!
- The earth conductors (PE) from the power supply, pump cables and valve cables are connected to the terminal block earth conductors.
- All cables are located so that people cannot step on them or trip over them.
- The cables fulfil the requirements specified in .
- The local power supply matches the data on the name plate of the controller.
- The power supply cable is to be connected to the mains as follows:
 - with a plug to a wall socket or
 - via an isolating device for full isolation in fixed locations
- The power supply cable is located according to the legal and local regulations of the responsible electricity supply company.

NOTICE!

Danger of damage and malfunction.

- Only connect components that do not overload the inputs and outputs of the controller; for more information, see the name plate and .

NOTICE!

- The polarity of signal inputs/outputs 1-4 and R_s is not fixed during connection.
- Only temperature probes of the type Pt1000 are permitted.
- Probe cables must be located at least 100 mm away from power supply cables.
- Use shielded probe cables if inductive sources are present, e.g. high-voltage cables, radio transmitters, microwave units.

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Position of the connection terminals

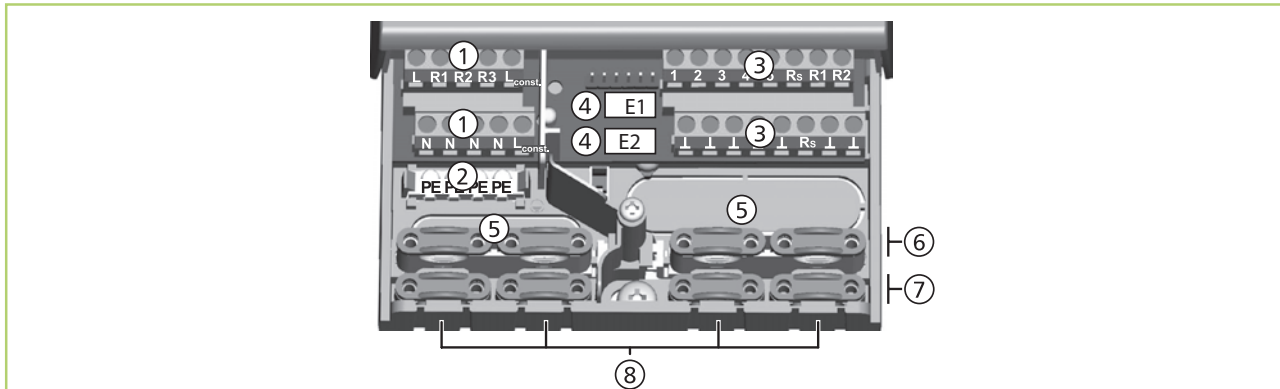


Fig. 29: Connection terminals in the lower part of the controller (terminal cover removed)

①	Terminal block power supplies:	
	L	1x phase conductor (power input)
	R1,	Output (TRIAC, for pumps or valves)
	R2	Switch contact REMKO RES valve (black)
	R3	Output (relay, for pumps or valves)
	L _{const.}	2x phase conductors, live phase REMKO RES valve (brown)
	N	4x neutral (combined neutral, REMKO RES valve (blue))
	NOTE: Outputs R1 and R2 are protected by an electronic fuse.	
②	Terminal block earth conductor:	
	PE	4x safety earth (combined safety earth for terminal block power supplies)
③	Terminal block signals:	
	1-4	4x probe input (temperature probe Pt1000)
	5	1x communication connection for cascading
	Rs	1x signal output (potential-free relay contact for protective low voltages)
	PWM R1	2x control outputs (control for high-efficiency pumps)
	PWM R2	Connection: PWM = brown, ⊥ = blue
	⊥	7x ground (combined ground for probe inputs and communication connections, as well as control outputs)
④	Multi-pin connector, only for internal use, 2 x input for REMKO FlowSonic (white)	
⑤	Cable openings on the back of the housing	
⑥	Top strain reliefs (2 identical plastic bridges, each with 2 strain reliefs; included in the delivery)	
⑦	Bottom strain reliefs	
⑧	Cable openings on the underside of the housing	

Preparing the cable openings

The cables can be fed through openings on the back of the housing or the underside of the housing. The openings are pre-cut and must be prepared as required before mounting.

You can prepare the cable openings on the back of the housing as follows:

1. ➤ Break the cable openings ⑤ (Fig. 29) through using a suitable tool.
2. ➤ Deburr the edges

You can prepare the cable openings on the underside of the housing as follows:

1. ➤ Cut the required cable openings ⑧ (Fig. 29) out left and right with a suitable knife and break them through.
2. ➤ Deburr the edges.

Connect the electric cables

- ✓ All cables are de-energised.
- ✓ The cable openings are prepared.

Connect the cables whilst observing the following points:

- Assign cables to the connection terminals as described in the following section ↗ *'Terminal assignment' on page 28.*
- Power input and outputs: First connect PE and then N and L.
- Strain reliefs:
 - First insert the strain reliefs at the bottom and then the strain reliefs at the top.
 - When using a strain relief at the top, use the plastic bridge as described below.
 - If the opening of a strain relief is too large, e.g. for thin cables, turn the strain relief frame (bend it downwards).
 - Only use strain reliefs with cabling through the underside of the housing. For cabling through the back of the housing, use external strain reliefs.

Insert or remove plastic bridges

You can insert the plastic bridges as follows:

1. ➤ Insert the right plastic bridge first using the locking catch ① (Fig. 30).
2. ➤ Press the other side of the plastic bridge down ② until the clip clicks into place.
3. ➤ Insert the left plastic bridge in the opposite manner (locking catch left, clip right).

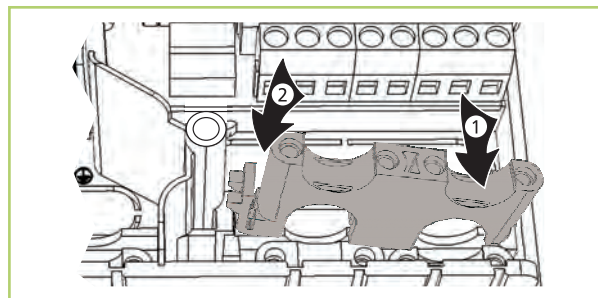


Fig. 30: Inserting the right plastic bridge

You can remove the plastic bridges as follows:

1. ➤ Insert a screwdriver ② on the right plastic bridge between the housing and the clip ① (Fig. 31).
2. ➤ Carefully push the screwdriver to the left ③. In this way, raise the clip ① to the right until the plastic bridge ④ is free.
3. ➤ Pull the plastic bridge upwards using your free hand ⑤.
4. ➤ Remove the left plastic bridge in the same way.

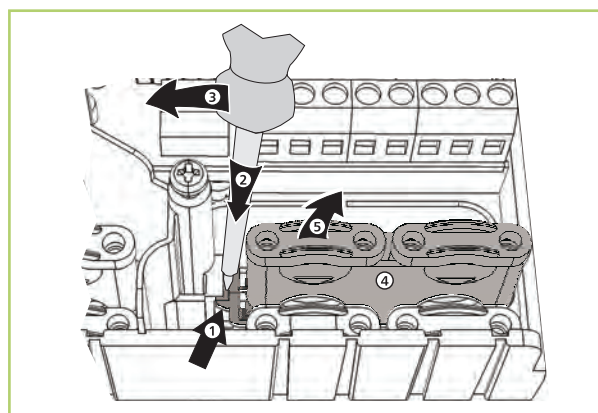


Fig. 31: Removing the right plastic bridge

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Terminal assignment

The following tables and circuit diagrams describe assignment of the external components (pumps, probes) to the controller terminals of the corresponding Friwa variant.

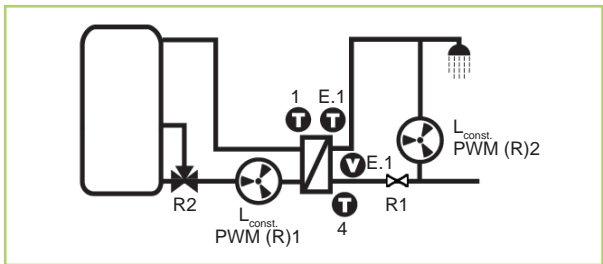
Fig. 32: The active R1 valve is not displayed in the controller display.

Inputs

Ter-minal	Individual operation / cascade operation
1, ⊥	Inlet temperature, primary (TVL)
2, ⊥	---
3, ⊥	---
4, ⊥	Cold water temperature, secondary (TKW)
E.1, T	Hot water temperature, secondary
E.1, V	Medium flow rate, secondary

Outputs

Ter-minal	Individual operation	Cascade operation
R1, N	---	Switching valve
R2, N	Return valve (optional)	Return valve (optional, on master controller)
R3, N	---	---
L _{const} , N	Primary pump, secondary pump (circulation)	Primary pump, secondary pump (circulation, on master controller)
PWM R1, ⊥	Primary pump	Primary pump
PWM R2, ⊥	Secondary pump (circulation)	Secondary pump (circulation, on master controller)
Rs, Rs	Alarm	Alarm



7 Commissioning



DANGER!

Danger of death due to electric shock!

Before initial commissioning, carry out all of the tasks described in [Chapter 5 'Assembly and dismantling'](#) on page 23 and [Chapter 6 'Electrical wiring'](#) on page 25 completely.



- After the unit has been disconnected from the mains for a long time, the date and time must be set again when switching on (see steps 1-5 below).
- Saved functions that are not connected to a time setting remain set even after an extended power failure (> 15 minutes).

The controller is pre-set when it is manufactured. You only have to set the date and time (Fig. 33).

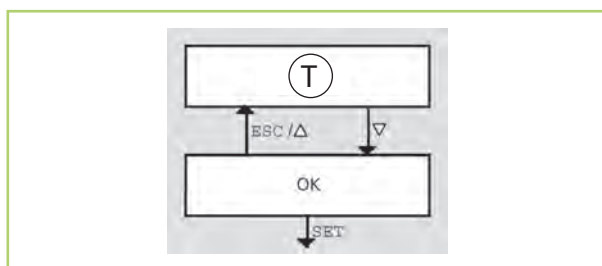


Fig. 33: Setting the time

T: Time

For information about operation, refer to

Values can be changed retroactively within controlled operation. The following applies:

- "▽/ESC/Δ" navigates forwards and backwards block by block
(Fig. 33: "▽" = forwards; "ESC/Δ" = backwards).
- Navigating (with "▽/ESC/Δ") is always possible after completing a block.
- Retroactive changes to a block are initiated using "SET".

You can bring the controller into operation as follows:

1. ➤ Set up the power supply to the controller.
 - The time 12:00 is displayed.
 - 12 flashes (Fig. 34)
2. ➤ Press "▽ Δ" to set the hour.
3. ➤ Press "SET". The minute flashes.
4. ➤ Press "▽ Δ" to set the minutes.
5. ➤ Press "SET".
6. ➤ Repeat steps 4 and 5 to set the year, month and date.

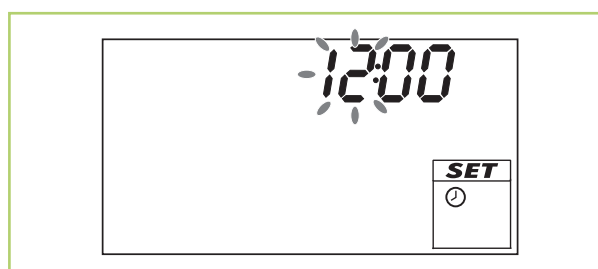


Fig. 34: Setting the time

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8 Troubleshooting and customer service

Error elimination



DANGER!

Danger of death due to electric shock!

- Disconnect the unit from the power supply immediately if safe operation can no longer be guaranteed, e.g. if there is visible damage.
- Disconnect the unit from the power supply before opening the housing.
- All works on the open unit may only be carried out by a specialist.





The controller is a quality product and was designed for many years of continuous use. Therefore, note the following points:

- *The cause of an error is often not the controller but one of the connected components.*
- *The following notes for identifying errors refer to the most common causes of errors.*
- *Do not send the controller in until you are sure that none of the causes of errors described here apply.*

General errors

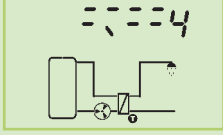
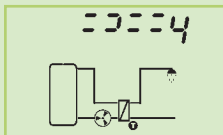
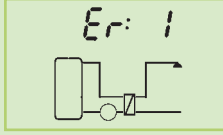
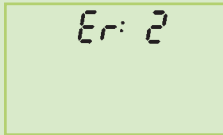
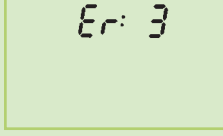
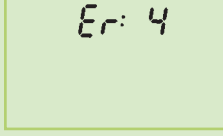
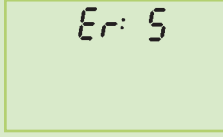
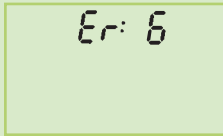
The unit and components are manufactured using state-of-the-art production methods and tested several times to verify their correct function. However, if alarms should occur, please check the functions as detailed in the list below. For systems with an indoor unit and outdoor unit, refer to the chapter "Troubleshooting and customer service" in both operating manuals. Please inform your dealer if the unit is still not working correctly after all function checks have been performed!

Error description	Cause	Remedial measures
The controller does not function		
The display is blank or dark	The power supply to the controller is interrupted	<ul style="list-style-type: none"> Check the power supply to the controller Check the power supply's fuse
The controller continually displays 12:00		
"12" flashes	The power supply to the controller was interrupted for more than 15 minutes	Set the time; saved functions that are not connected to a time setting remain set even after an extended power failure. The circulation (if the time window "cc" was activated") and thermal disinfection functions are inactive
The primary pump does not run even though domestic water is being dispensed		
The pump symbol rotates	The power supply or control signal to the pump is interrupted	Check the mains power and control line to the pump
	The pump is stuck	Unblock the pump, replace it if necessary
The pump symbol does not rotate	The domestic hot water maximum temperature is temporarily exceeded	This is not an error
<ul style="list-style-type: none"> The pump symbol does not rotate The display is red  Flashes 	Manual operation is switched on, output R1 is set to 0 (off)	Switch on automatic operating mode
<ul style="list-style-type: none"> The pump symbol does not rotate The display is red 	A short circuit or an interruption for the temperature probe	<ul style="list-style-type: none"> Query the current value of the connected temperature probe on the controller Check the probes and cables
The primary pump runs even though no domestic water is being dispensed		
The pump symbol rotates	<ul style="list-style-type: none"> The comfort function is active Thermal disinfection is active Circulation is active The probe identifies dispensing The pump runs due to blocking protection 	<ul style="list-style-type: none"> This is not necessarily an error Deactivate the functions if necessary Probe error E.1 (continual display of a flow)
<ul style="list-style-type: none"> The pump symbol rotates The display is red  is displayed 	Manual operation is switched on, output H1 is set to > 10%	Switch on automatic operating mode
The primary pump is running, domestic water is being dispensed, heat is not transported to the heat exchanger		
The pump symbol rotates	There is air in the primary circuit	Check the primary circuit for air
	Shut-off valve closed	Check the shut-off valve
	The heat exchanger is dirty or scaled	Flush/clean the heat exchanger according to the manufacturer's instructions.

REMKO fresh water station Controller

Error messages

Errors are displayed as shown below, the background lighting is red. The figures in this section show system examples.

Display (example)	Description	Solution
	An interruption was detected on the probe input displayed (here: probe input 4).	Check the cables and probes connected to the probe input.
	A short circuit was detected on the probe input displayed (here: probe input 4).	Check the cables and probes connected to the probe input.
	The domestic hot water target temperature was not reached. Possible causes: <ul style="list-style-type: none"> ■ The storage tank not heated ■ The shut-off valve in the primary circuit is closed. ■ There is air in the pipes ■ The primary pump is defective ■ The heat exchanger is scaled 	<ul style="list-style-type: none"> ■ Heat up the storage tank ■ Check the shut-off valve ■ Bleed the system ■ Check the pump ■ De-scale the heat exchanger
	A short circuit occurred at output R1. Possible causes: <ul style="list-style-type: none"> ■ The valve is defective ■ There is a wiring fault 	<ul style="list-style-type: none"> ■ Check the valve ■ Check the wiring of R1
	Output R1 was overloaded. Cause: The values permitted for R1 according to the name plate were exceeded continuously, the output was switched off.	Check the electrical data of the valve, replace the valve if necessary. R1 is switched back on automatically.
	A short circuit occurred at output R2. Possible causes: <ul style="list-style-type: none"> ■ The valve is defective ■ There is a wiring fault 	<ul style="list-style-type: none"> ■ Check the valve ■ Check the wiring of R2
	Output R2 was overloaded. Cause: The values permitted for R1 according to the name plate were exceeded continuously, the output was switched off.	Check the electrical data of the valve, replace the valve if necessary. R2 is switched back on automatically.
	In cascade operation, no communication between master and slave controller took place for a minimum of 1 min. Possible causes: <ul style="list-style-type: none"> ■ - Cascade functions inadvertently activated ■ - Master (MA) or Slave (SL) is set at both controllers 	<ul style="list-style-type: none"> ■ Automatic fault correction after successful communication ■ Deactivate cascade function ■ Check the master/slave settings

Error on the probe

An error on a probe only affects the functions that use the probe. The controller can no longer execute the affected function correctly and stops controlling this function. All other functions of the controller continue to work properly.

Error on the probe	Terminal	Effect on control
Inlet temperature, primary (TVL)	1, ⊥	The controller takes 75 °C as the preliminary value so that regulation can continue to be carried out.
Hot water temperature, secondary (TWW)	2, ⊥	The controller uses the temperature value of the E.1 and T probes for regulation.
Source temperature, primary (TQ)	3, ⊥	The source temperature has no effect on regulation.
Cold water temperature, secondary (TKW)	4, ⊥	The cold water temperature has no effect on regulation
Hot water temperature, secondary	E.1, T	FriwaMini Basic and Premium: Regulation stops. FriwaMidi, FriwaMaxi, FriwaMega: The hot water temperature at terminals 2, ⊥ is used for regulation. An error on E.1, T has no long-term effect on regulation.
Medium flow rate, secondary	E.1, V'	Regulation stops.

Check the temperature probe Pt1000



DANGER!

Danger of death due to electric shock!

Before opening the unit, ensure that all cables that lead to the unit are disconnected from the mains and cannot be inadvertently connected to the mains!

1. ➡ Remove the terminal cover.
2. ➡ Disconnect the temperature probe.
3. ➡ Measure the resistance of the temperature probe with an ohmmeter and compare them with the table below. Slight variations are permitted.
4. ➡ Attach the terminal cover.

Correlation between temperature and resistance

Temperature [°C]	-30	-20	-10	0	10	20	30	40	50	60	70
Resistance [Ω]	882	922	961	1000	1039	1078	1117	1155	1194	1232	1271

Temperature [°C]	80	90	100	110	120	130	140	150	160	170	180
Resistance [Ω]	1309	1347	1385	1423	1461	1498	1536	1573	1611	1648	1685

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REMKO, a partner helping you find solutions to your problems.

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