

# FWCK

CASCADE CONTROLLER



## CONTROLLER MANUAL

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# Safety instructions

## A.1 EC declaration of conformity

By affixing the CE mark to the unit the manufacturer declares that the FWCK conforms to the following relevant safety regulations:

- EC low voltage directive 73/23/EEC, as amended by 93/68/EEC
- EC electromagnetic compatibility directive 89/336/EEC version 92/31/EEC version 93/68/EEC

Conformity has been verified and the corresponding documentation and the EC declaration of conformity are kept on file by the manufacturer.

## A.2 General instructions

**It is essential that you read this!**

These installation and operating instructions contain basic instructions and important information regarding safety, installation, commissioning, maintenance and the optimal use of the unit. Therefore these instructions must be read completely and understood by the installation technician/specialist and by the system user before installation, commissioning and operation of the unit.

The valid accident prevention regulations, VDE regulations, the regulations of the local power utility, the applicable DIN-EN standards and the installation and operating instruction of the additional system components must also be observed. The controller does not under any circumstances replace any safety devices to be provided by the customer!

Installation, electrical connection, commissioning and maintenance of the unit may only be carried out by specialists who possess the appropriate training.

For the user: Make sure that the specialist gives you detailed information on the function and operation of the controller. Always keep these instructions in the vicinity of the controller.

## A.3 Explanation of symbols



Danger

Failure to observe these instructions can result in danger to life from electric voltage.



Danger

Failure to observe these instructions can result in serious damage to health such as scalding, or even life-threatening injuries.



Caution

Failure to observe these instructions can result in destruction of the unit or the system, or damage to the environment.



Caution

Information which is especially important for the function and optimal use of the unit and the system.

# Safety instructions

## A.4 Changes to the unit



Changes to the unit can compromise the safety and function of the unit or the entire system.

- Changes, additions to or conversion of the unit are not permitted without the written permission from the manufacturer
- It is likewise forbidden to install additional components that have not been tested together with the unit
- If it becomes clear that safe operation of the unit is no longer possible, for example because of damage to the housing, then turn the controller off immediately
- Any parts of the unit or accessories that are not in perfect condition must be exchanged immediately
- Use only original spare parts and accessories from the manufacturer.
- Markings made on the unit at the factory must not be altered, removed or made illegible
- Only the settings actually described in these instructions may be made on the controller

## A.5 Warranty and liability

The controller has been manufactured and tested with regard to high quality and safety requirements. The unit is subject to the statutory guarantee period of two years from the date of sale.

The warranty and liability shall not include, however, any injury to persons or material damage that is attributable to one or more of the following causes:

- Failure to observe these installation and operating instructions
- Improper installation, commissioning, maintenance and operation
- Improperly executed repairs
- Unauthorised structural changes to the unit
- Installation of additional components that have not been tested together with the unit
- Any damage resulting from continued use of the unit despite an obvious defect
- Failure to use original spare parts and accessories
- Use of the device for other than its intended purpose
- Operation above or below the limit values listed in the specifications
- Force majeure

# Description of controller

## B.1 Specifications

### Electrical specifications:

Mains voltage	230VAC +/- 10%
Mains frequency	50...60Hz
Power consumption	2VA
Switched power	
overall	460VA (relay output 1-4)
per relay	460VA for AC1 / 185W for AC3
Internal fuse	2A slow-blow 250V
Protection category	IP40
Protection class	II
Sensor inputs	1x Vortex Flow Sensor (VFS)

### Permissible ambient conditions:

Ambient temperature	
for controller operation	0°C...40°C
for transport/storage	0°C...60°C
Air humidity	
for controller operation	max. 85% rel. humidity at 25°C
for transport/storage	no moisture condensation permitted

### Other specifications and dimensions

Housing design	2-part, ABS plastic
Installation methods	Wall installation, optionally panel installation
Overall dimensions	163mm x 110mm x 52mm
Aperture installation dimensions	157mm x 106mm x 31mm
Display	Fully graphical display, 128 x 64 dots
Light diode	Multicolour
Operation	4 entry keys

<b>Temperature sensors:</b>	(may not be included in the scope of supply)
Vortex Flow Sensor (VFS)	Flow rate and water temperature
Lead Vortex Flow sensor :	prolongable to max. 3m

# Description of controller

## B.2 About the controller

The FWCK can control the flow to 4 more fresh water stations by means of stop valves.

The first fresh water station runs independently. The secondary fresh water stations flow are controlled via stop valves. A flow sensor is integrated into every single station. The FWCK is monitoring the entire flow. 4 On and Off limits are set in the FWCK, at which the individual stations stop valves are switched.

To ensure an equal use of the fresh water stations the FWCK changes the station switched first when the flow reaches 0 L/min.

Important characteristics of the FWCK:

- Depiction of graphics and texts in a lighted display
- Simple viewing of the current measurement values
- Analysis and monitoring of the system by means of statistical graphics, etc.
- Extensive setting menus with explanations
- Menu block can be activated to prevent unintentional setting changes



Every fresh water station has to be equipped with a flow limiter to prevent damage to the VFS.



Every fresh water station has to be configured separately.

## B.3 Scope of supply

- Temperature Difference Controller FWCK
- replacement fuse 2A slow-blow
- Installation and operating instructions

## B.4 Disposal and pollutants

The unit conforms to the European RoHS directive 2011/65/EU for the restriction of the use of certain hazardous substances in electrical and electronic equipment.



The unit must not under any circumstances be disposed of with ordinary household refuse. Dispose of the unit only at appropriate collection points or ship it back to the seller or manufacturer.

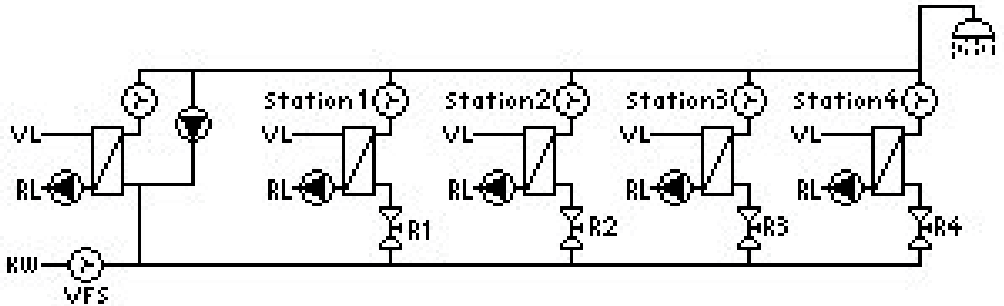
# Description of controller

## B.5 Hydraulic variant



Caution

The following illustration should be viewed only as schematic diagrams showing the respective hydraulic system, and do not claim to be complete. The controller does not replace safety devices under any circumstances. Depending on the specific application, additional system components and safety components may be mandatory, such as check valves, non-return valves, safety temperature limiters, scalding protectors, etc., and must therefore be provided.



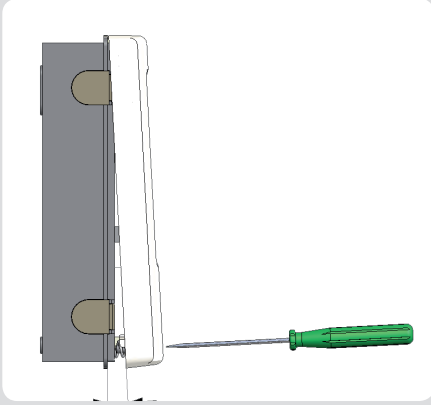
# Installation

## C.1 Wall installation



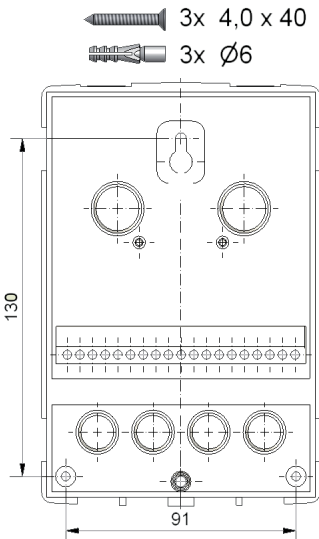
Install the controller only in dry areas and under the ambient conditions described under B.1 "Specifications". Carry out the following steps 1-8.

### C.1.1



1. Unscrew cover screw completely
2. Carefully pull upper part of housing from lower part.
3. Set upper part of housing aside, being sure not to touch the electronics when doing so.
4. Hold the lower part of the housing up to the selected position and mark the 3 mounting holes. Make sure that the wall surface is as even as possible so that the housing does not become distorted when it is screwed on.

### C.1.2



5. Using a drill and size 6 bit, drill 3 holes at the points marked on the wall and push in the plugs.
6. Insert the upper screw and screw it in slightly.
7. Fit the upper part of the housing and insert the other two screws.
8. Align the housing and tighten the three screws.



# Installation

## C.2 Electrical connection



Before working on the unit, switch off the power supply and secure it against being switched on again! Check for the absence of power! Electrical connections may only be made by a specialist and in compliance with the applicable regulations.  
Do not use the controller if the housing shows visible damage.



Low-voltage cables such as temperature sensor cables must be routed separately from mains voltage cables. Feed temperature sensor cables only into the left-hand side of the unit, and mains voltage cables only into the right-hand side.

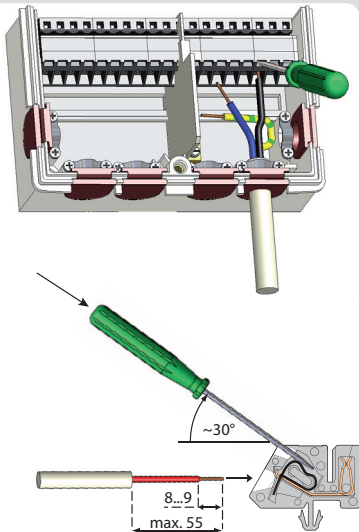


The customer must provide an all-pole disconnecting device, e.g. a heating emergency switch.



The cables being connected to the unit must not be stripped by more than 55mm, and the cable jacket must reach into the housing just to the other side of the strain relief.

### C.2.1



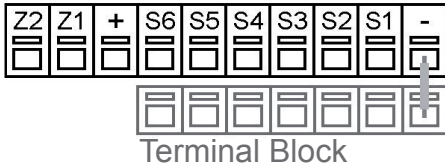
1. Open controller as described under C.1.
2. Strip cables by 55mm max., insert, fit the strain relief devices, strip the last 8-9mm of the wires (Fig. C.2.1)
3. Open the terminals using a suitable screwdriver (Fig. C.2.1) and make electrical connections on the controller
4. Refit upper part of housing and fasten with screw.
5. Switch on mains voltage and place controller in operation.

# Installation

## D Electrical connections



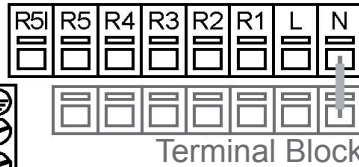
low voltage max.  
12VAC/DC



Terminal Block



Mains side  
230VAC 50-60Hz



Terminal Block



PE

Connections low voltage compartment:

- Temperature sensors terminal block S1-S6 and terminal block S- (polarity freely selectable)
- optional additional functions at terminal Z1/Z2

**Low voltage max. 12VAC/DC** connection in the left-hand terminal compartment!

Terminal: Connection for:

S1	not used
S2	not used
S3	not used
S4	not used
S5	VFS temperature (yellow)
S6	VFS flow rate (white)
+	VFS +5V DC (brown)
Z1	Option / additional function
Z2	Option / additional function
-	jumper terminal block S- e.g. VFS - (green)

Connection of sensor earths S1-S6 via terminal block sensor S.

The polarity of the sensors is freely selectable.

Connection mains voltage compartment:

- The PE protective conductor must be connected to the PE metal terminal block!
- Connection of relay lead N via terminal block Sensor N
- Mains phase conductor terminal L
- Relay outputs terminals R1-R4
- Potential free terminal R5/R5I

Attention: only suitable for 230V!

**Mains voltage 230VAC 50-60Hz** connection in the right-hand terminal compartment!

Terminal: Connection for:

L	Mains phase conductor L
R1	Valve 1
R2	Valve 2
R3	Valve 3
R4	Valve 4
R5	not used
R5I	not used
N	Jumper terminal block N

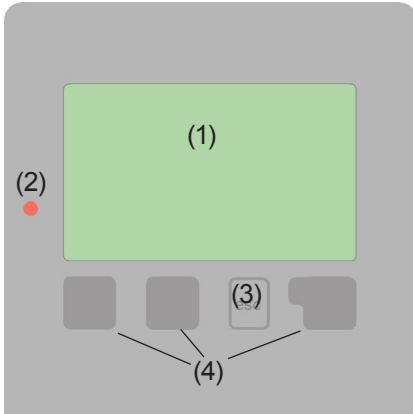
The PE protective conductor must be connected to the PE metal terminal block!



A bridge from R2 to R1 must be placed by customer for the operation of a two station cascade!

# Operation

## E.1 Display and input



The display (1), with its extensive text and graphics mode, is almost self-explanatory, allowing easy operation of the controller.

The LED (2) lights up green when a relay is switched on.

The LED (2) lights up red when operating mode “Off” is set.

The LED (2) flashes slowly red in the operating mode “Manual”.

The LED (2) flashes quickly red when an error is present.

Entries are made using four keys (3+4), which are assigned to different functions depending on the situation. The “esc” key (3) is used to cancel an entry or to exit a menu. If applicable there will be a request for confirmation as to whether the changes which have been made should be saved.

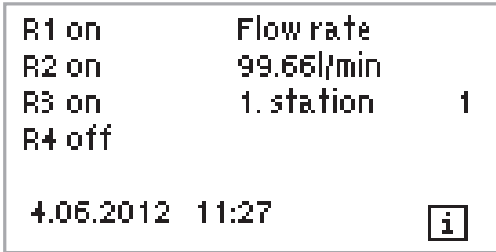
The function of each of the other three keys (4) is shown in the display line directly above the keys; the right-hand key is generally has a confirmation and selection function.

Examples of key functions:

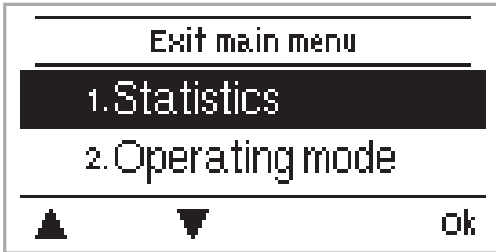
+/-	= enlarge/shrink values
▼/▲	= scroll menu down/up
yes/no	= approve/reject
Info	= additional information
Back	= to previous screen
ok	= confirm selection
Confirm	= confirm setting

# Operation

## E.2 Menu sequence and menu structure



The graphics or overview mode appears when no key has been press for 2 minutes, or when the main menu is exited by pressing “esc”.



Pressing a key in graphics or overview mode takes you directly to the main menu. The following menu items are then available for selection there:



- 1. Statistics
- 2. Operating Mode
- 3. Settings
- 4. Special functions
- 5. Menu lock
- 6. Service data
- 7. Language

Function control of the system with operating hours, etc

Automatic mode, manual mode or switch unit off

Set parameters needed for normal operation

Sensor calibration, clock, commissioning, etc.

Against unintentional setting changes at critical points

For diagnosis in the event of an error

Language selection

# Parametrisation

## E.3 Commissioning help



The first time the controller is turned on and after the language and time are set, a query appears as to whether you want to parametrise the controller using the commissioning help or not. The commissioning help can also be terminated or called up again at any time in the special functions menu. The commissioning help guides you through the necessary basic settings in the correct

order, and provides brief descriptions of each parameter in the display.

Pressing the “esc” key takes you back to the previous value so you can look at the selected setting again or adjust it if desired. Pressing the “esc” more than once takes you back step by step to the selection mode, thus cancelling the commissioning help. Finally, menu 2.2 under operating mode “Manual” should be used to test the switch outputs with the consumers connected, and to check the sensor values for plausibility. Then switch on automatic mode.



Caution

Observe the explanations for the the individual parameters on the following pages, and check whether further settings are necessary for your application.

## E.4 Free commissioning

If you decide not to use the commissioning help, you should make the necessary settings in the following sequence:

- Menu 4. Settings, all values
- Menu 3. Special functions if additional changes are necessary

Finally, menu 2.2 under operating mode “Manual” should be used to test the switch outputs with the consumers connected, and to check the sensor values for plausibility. Then switch on automatic mode.



Caution

Observe the explanations for the the individual parameters on the following pages, and check whether further settings are necessary for your application.

# Statistics

## 1. - Statistics



The menu “1. Statistics” is used for function control and long-term monitoring of the system.

The menu is closed by pressing “esc” or selecting “Exit statistics”.



Caution

For analysis of the system data it is essential for the time to be set accurately on the controller. Please note that the clock does not continue to run if the mains voltage is interrupted, and must therefore be reset. Improper operation or an incorrect time may result in data being deleted, recorded incorrectly or overwritten.

The manufacturer accepts no liability for the recorded data!

### 1.1. - Message log

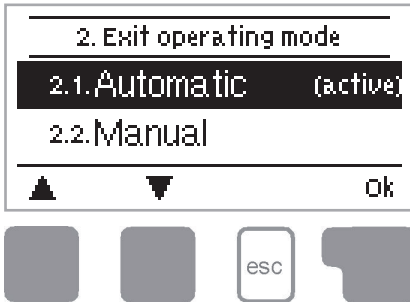
Display of the last 10 events occurring in the system with indication of date and time.

### 1.2. - Reset/clear

Resetting and deleting the individual analyses. The function “All statistics” clears all analyses but not the error messages.

# Operating modes

## 2. - Operating modes



In menu "2. Operating modes" the controller can either be placed in automatic mode, switched off, or placed in a manual operating mode.

The menu is closed by pressing "esc" or selecting "Exit operating modes".

### 2.1. - Automatic

Automatic mode is the normal operating mode of the controller. Only automatic mode provides proper controller function taking into account the current temperatures and the parameters that have been set! After an interruption of the mains voltage the controller automatically returns to the last operating mode selected!

### 2.2. - Manual

The relay and thus the connected consumer are switched on and off by pressing a key, with no regard to the current temperatures and the parameters which have been set. The measured temperatures are also shown to provide an overview and function control. The high efficiency pump is labeled "Relay 6" despite being connected to the Z terminal clamps.



When operating mode "Manual" is activated, the current temperatures and the selected parameters are no longer considered. There is a danger of scalding or serious damage to the system. The operating mode "Manual" may only be used by specialists for brief function tests or during commissioning!

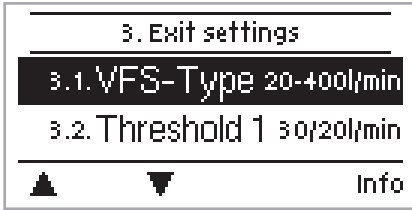
### 2.3. - Off



When the operating mode "Off" is activated, all controller functions are switched off. This can lead, for example, to overheating on the solar collector or other system components. The measured temperatures are still displayed to provide an overview.

# Settings

## 3. - Settings



The necessary basic settings required for the control function are made in menu "5. Settings".



This does not under any circumstances replace the safety facilities to be provided by the customer!

The menu is closed by pressing "esc" or selecting "Exit settings".

The FWCK can control the flow to 4 more fresh water stations by means of stop valves.

The first fresh water station runs independently. The secondary fresh water stations flow are controlled via stop valves. A flow sensor is integrated into every single station. The FWCK is monitoring the entire flow. 4 On and Off limits are set in the FWCK, at which the individual stations stop valves are switched.

To ensure an equal use of the fresh water stations the FWCK changes the station switched first when the flow reaches 0 L/min.

To deactivate stations 2 to 4, the switch-on value can be set to „Off“.



Every Fresh water station has to be equipped with a flow limiter to prevent damage to the VFS sensor.

### 3.1. - VFS Type

This menu is used to set the type of VFS sensor used.

*VFS-Type- Settings range: 5-100, 10-200, 20-400 l/min / Default: 20-400 l/min*

### 3.2. - Threshold 1

This menu is used to set the flow rate, at which the relay is being switched.

*Settings range:*

*Switch-on value: 1 to 400 l/min / Default: 30 l/min*

*Switch-off value: 1 to 400 l/min / Default: 20 l/min*



# Settings

## 3.3. - Threshold 2

This menu is used to set the flow rate, at which the relay is being switched.

*Settings range:*

*Switch-on value: 1 to 400 l/min / Default: 60 l/min*

*Switch-off value: 1 to 400 l/min / Default: 50 l/min*

## 3.4. - Threshold 3

This menu is used to set the flow rate, at which the relay is being switched.

*Settings range:*

*Switch-on value: 1 to 400 l/min / Default: 90 l/min*

*Switch-off value: 1 to 400 l/min / Default: 80 l/min*

## 3.5. - Threshold 4

This menu is used to set the flow rate, at which the relay is being switched.

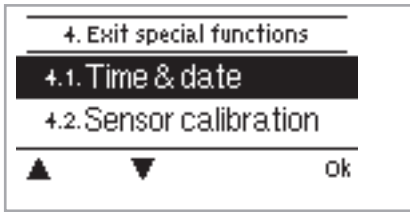
*Settings range:*

*Switch-on value: 1 to 400 l/min / Default: 120 l/min*

*Switch-off value: 1 to 400 l/min / Default: 110 l/min*

# Special functions

## 4. - Special functions



Menu "4. Special functions" is used to set basic items and expanded functions.



Other than the time all settings may only be made by a specialist.

The menu is closed by pressing "esc" or selecting "Exit special functions".

### 4.1. - Time & date

This menu is used to set the current time and date.



Caution

For analysis of the system data it is essential for the time to be set accurately on the controller. Please note that the clock does not continue to run if the mains voltage is interrupted, and must therefore be reset.

### 4.2. - Sensor calibration

Deviations in the temperature values displayed, for example due to cables which are too long or sensors which are not positioned optimally, can be compensated for manually here. The settings can be made for each individual sensor in steps of 0.5°C.

*Offset S1...S3 per setting range: -100 to +100 (translates to -50°C...+50°C)*

*Default setting: 0*



Caution

Settings are only necessary in special cases at the time of initial commissioning by the specialist. Incorrect measurement values can lead to unpredictable errors.

### 4.3. - Commissioning

Starting the commissioning help guides you in the correct order through the basic settings necessary for commissioning, and provides brief descriptions of each parameter in the display.

Pressing the "esc" key takes you back to the previous value so you can look at the selected setting again or adjust it if desired. Pressing the "esc" more than once takes you back to the selection mode, thus cancelling the commissioning help. (see also E.2).



Caution

May only be started by a specialist during commissioning! Observe the explanations for the individual parameters in these instructions, and check whether further settings are necessary for your application.

# Special functions

## 4.4. - Factory settings

All of the settings that have been made can be reset, thus returning the controller to its delivery state.

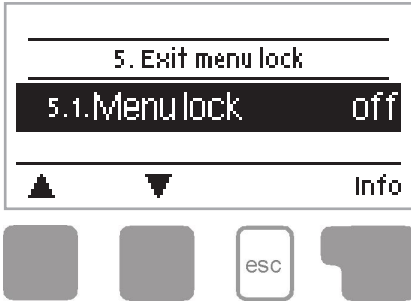


**Caution**

The entire parametrisation, analyses, etc. of the controller will be lost irrevocably. The controller must then be commissioned once again.

# Menu lock

## 5. - Menu lock



Menu "5. Menu lock" can be used to secure the controller against unintentional changing of the set values.

The menu is closed by pressing "esc" or selecting "Exit menu lock".

The menus listed below remain completely accessible despite the menu lock being activated, and can be used to make adjustments if necessary:

1. Analysis
5. Menu lock
6. Service values

To lock the other menus, select "Menu lock on".

To enable the menus again, select "Menu lock off".

Setting range: on, off/default setting: off

# Service values

## 6. - Service values

6.1. FWCK 2011/05/05.9259  
6.2. Temperature 88°C  
6.3. Flow rate 99.66l/min

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▲ ▼



The menu “6. Service values” can be used for remote diagnosis by a specialist or the manufacturer in the event of an error, etc.



Enter the values at the time when the error occurs e.g. in the table.

Caution

The menu can be closed at any time by pressing “esc”.

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# Language

## 7. - Language

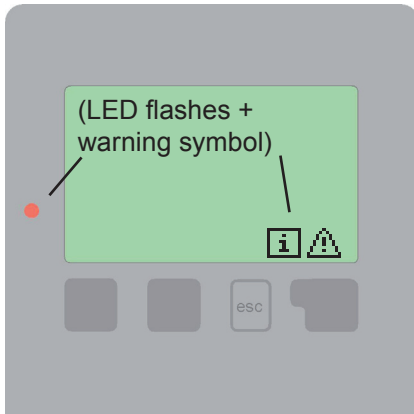


Menu “7. Language” can be used to select the language for the menu guidance. This is queried automatically during initial commissioning.

The choice of languages may differ, however, depending on the device design. Language selection is not available in every device design!

# Malfunctions

## 7.1. Malfunctions with error messages



If the controller detects a malfunction, the red light flashes and the warning symbol also appears in the display. If the error is no longer present, the warning symbol changes to an info symbol and the red light no longer flashes.

To obtain more detailed information on the error, press the key under the warning or info symbol.



Do not try to deal with this yourself.  
Consult a specialist in the event of an error!

Possible error messages:  
Sensor x defective

Notes for the specialist:

Means that either the sensor, the sensor input at the controller or the connecting cable is/was defective.

Time&date

This message appears automatically after a mains failure because the time&date have to be checked, and reset if necessary.

# Malfunctions

## Z.2 Replacing the fuse

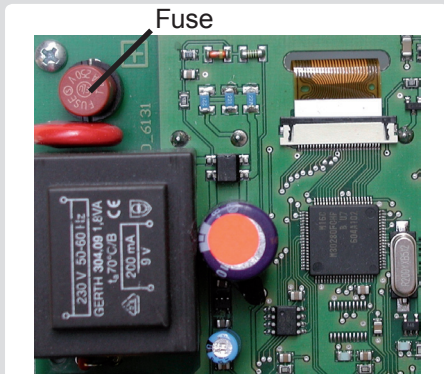


Repairs and maintenance may only be performed by a specialist. Before working on the unit, switch off the power supply and secure it against being switched on again! Check for the absence of power!



Only use the supplied spare fuse or a fuse of the same design with the following specifications: T2A 250V

### Z.2.1



If the mains voltage is switched on and the controller still does not function or display anything, then the internal device fuse may be defective. In that case, open the device as described under C, remove the old fuse and check it.

Exchange the defective fuse for a new one, locate the external source of the error (e.g. pump) and exchange it.

Then first recommission the controller and check the function of the switch outputs in manual mode as described under 2.2.

## Z.3 Maintenance



In the course of the general annual maintenance of your heating system you should also have the functions of the controller checked by a specialist and have the settings optimised if necessary.

Performing maintenance:

- Check the date and time
- Assess/check plausibility of analyses
- Check the error memory
- Check the switch outputs/consumers in manual mode (see 2.2)
- Poss. optimise the parameter settings

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Hydraulic variant set:

Commissioned on:

Commissioned by:

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Final declaration:

Although these instructions have been created with the greatest possible care, the possibility of incorrect or incomplete information cannot be excluded. Subject as a basic principle to errors and technical changes.

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