INDUSTRIAL
WATER EQUIPMENT

Controller for reverse osmosis plants

Operating manual

Software version 1.01

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1. System description

1.1. General

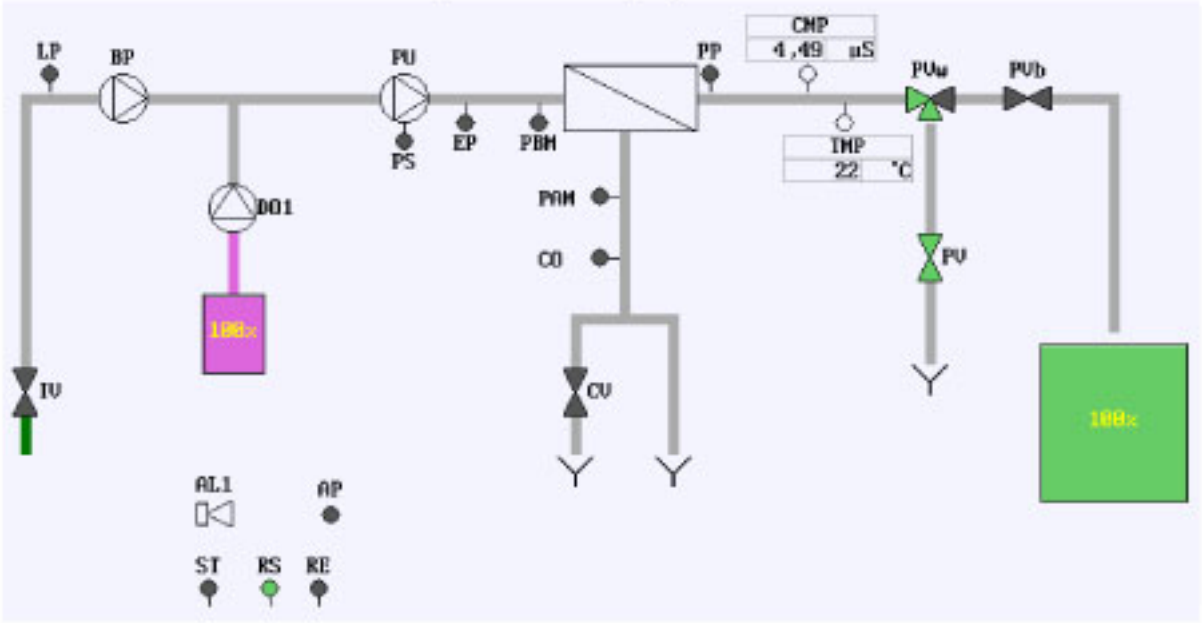
The RGS3000 is applicable for the automatic control and monitoring of reverse osmosis units. Thanks to the flexible programmable software this controller is suitable for a large number of various water treatment applications.

1.2. Functionality overview

- Menu-driven operating and programming of controller graphic monochrome LCD display (128x64).
- Operates via 4 keys.
- Choice of languages.
- Universally applicable to reverse osmosis plants.
- Flexibly programmable for specific user requirements.
- Desalinated water production via manual controls or level switches
- Locking of maintenance (rinsing phase) via code possible
- Free programmable service telephone number.
- Programming locally and via web browser
- Schematic diagram via web browser
- Measurement data logging via RS485 and SD card.
- Alarm logging via RS485, SD card and E-mail.
- 5 free programmable inputs for potential free switches.
  Available input functions: High-level switch, Low-level switch, Low pressure, Overpressure, Concentrate flow monitoring, Motor protection, Alarm reset, Regeneration, Pressure before membrane, Pressure after membrane and Permeate pressure
- 5 free programmable relay outputs
  Available relay functions: High-pressure pump, Inlet valve, Concentrate valve, Permeate rinse valve, Permeate block valve, Permeate 3-way valve, Dosing pump, Booster pump, Alarm, additional program
- Measurements:1 conductivity meter and 1 temperature meter
- Integrated conductivity meter with automatic measurement range switching
- Conductivity measurement range according to the sensor used (0,5 – 100.000 µS/cm).
- Cell constant of the sensor programmable from 0,01 – 10,00 cm^{-1}
- Manual or automatic temperature compensation
- Alarm history: last 20 alarms are stored with date and time
- Update of software via SD card
- Date and time with battery
- Securing program information in the event of a loss of voltage, the program information is stored without battery.
- Manufactured according to EMC guidelines.
- Casing suitable for wall mount, mounting and *panel* mounting.
- Available in 24/24V, 115/115V, 230/230V, 115/24V, 230/24V, 240/24V

1.3. Diagram of the unit

The unit is schematically represented in the following diagram
The diagram features all the components defined in the controller. Only the components that are connected to the available in- and outputs can be displayed.



§ 27 "Terminology" on page 76 offers an overview of the meaning of the abbreviations used. These abbreviations may differ from the picture, because they have been modified by the user.

1.4. Unit configuration

In the controller the unit configuration can be configured via the menu option "Unit" (in the main menu). First of all, an inventory has to be made of the components that have to be driven by the controller, and to which pins these components are connected. The inventory is described in § 5 "Unit Configuration" on page 8

Subsequent to the inventory any delays, limits etc. can be set for the various components under the "Programming - Components " option. This is described in § 6 "Component" on page 11.
Next the various phases ("Production", "Rinse" etc.) can be programmed.
The functions that are switched on or switched off can be set for each phase. A time duration may also be entered. This is described in § 7 "RO Unit" on page 25.

1.5. Description of the unit

The controller distinguishes different phases:

- Production	Production of desalinated water
- Rinse (after Production)	Rinsing the membrane after production
- Rinse during Standby	Rinsing the membrane when stopped
- Rinse during Production	Rinsing the membrane during production
- Maintenance	Unit maintenance
- Regeneration	Switch off through pre-switched softening installation. Regeneration input active
- Standby	Installation out of service : no production of desalinated water
- Standby Stop	Installation out of service : only be switched on manually.
- Alarm	Installation out of service : no production of desalinated water

The controller is routinely delivered in the "Standby Stop" phase. The unit will not be automatically started until this is switched on manually (see § 9.1 "Standby stop" on page 33. Once it is switched on, the controller will no longer start in this phase after a power failure, unless this phase is activated via the programming (see § 7.9 "Standby Stop" on page 29).

Desalinated water can start to be produced depending on the level switch (es) (HL and LL) or manually. During production a service hour counter is maintained which can be read off under the menu option "Information" (see 10.5 "Counters" on page 36). A maintenance-related counter will also be maintained, if this is programmed (see § 20.2 "Maintenance" on page 65). This can be read off in the same window as the service hours counter.

During the "Production" phase the unit can be switched off manually (see § 9.4 "Production" on page 34), irrespective of the status of the level switches in the storage tank. The unit will go, depending on programming, into the "Rinse" phase or the "Standby " phase.
The lower bar in the main window will then show that unit has been manually switched off. The unit will no longer be automatically switched on until the unit is manually turned on again.

It is also possible to activate a rinse during production (see § 7.5 "Rinse during production" on page 27) and a rinse during Standby (see § 7.4 "Rinse during Standby " on page 27).

For maintenance activities by a maintenance technician the "Maintenance" phase is available in the controller. This phase is accessible only via the "Standby" phase (see § 9.3 "Standby" on page 33). Maintenance is not automatically started straightaway, as the unit first of all starts in the "rest" position. The actual maintenance phase can be started from this position (see 9.2 "Maintenance" on page 33). In § 7.6 "Maintenance" on page 28 and § 20.2 "Maintenance" on page 65 there is more information about the phase "Maintenance ".

A special phase is available to show if a water softening system is in regeneration. The "Regeneration" input then has to be activated. All outputs are switched off in this phase. Only a limited number of inputs are controlled.
See also § 7.7 "Regeneration" on page 29.

If a phase is interrupted because of an alarm situation the top bar will show there is an alarm situation. Also shown is the phase when the alarm occurred, the cause of the interruption and how the unit is switched on again.
§ 7.10 "Alarm" on page 30 In § 7.6 "Maintenance" on page 28 and § 20.2 "Maintenance" on page there is more information about the phase "Maintenance".

2. Picture of front side

1 LCD display

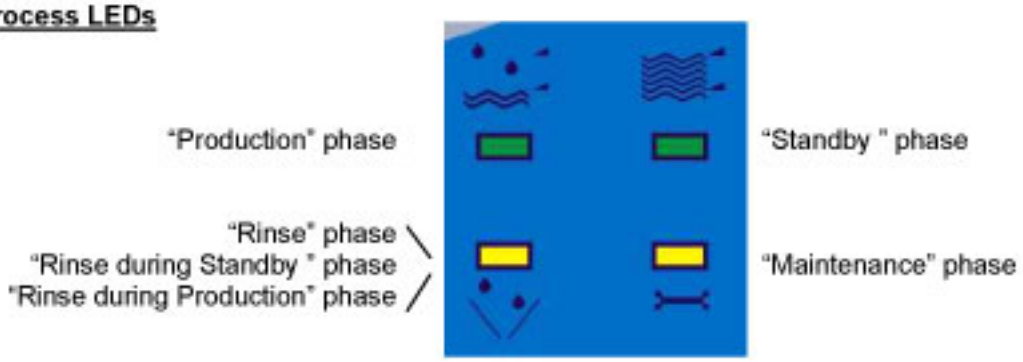
2 LED: Production
3 LED: Standby
4 LED: Rinse, Rinse Standby, Rinse during production
5 LED: Maintenance
6 LED: Alarm

7 Key: Alarm window, Escape
8 Key: Navigation
9 Key: Navigation
10 Key: Main menu, Enter

3. Measurement and function display

3.1. LED display

Process LEDs

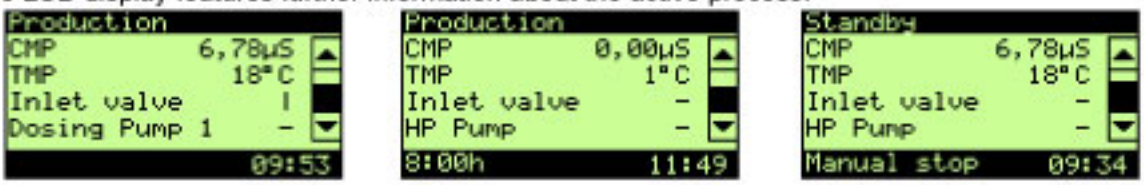


Alarm LED

This LED switches on if there is a cause for an alarm. If the cause of the alarm has been removed or if the alarm is confirmed the LED switches off. If the alarm is confirmed the LED is switched on again for a new alarm situation.

3.2. LCD display

The LCD display features further information about the active process.



Picture 3.1

The top bar displays the process the unit is in. Also shown are the measurement values or statuses of the connected components.
Keys ▲ and ▼ can be used to navigate between the various windows with measurement values and statuses.

Measurement values:
A conductivity cell and a temperature sensor can be connected to the controller. These will be displayed in one line, as seen in the above example. ("CMP" 0,00uS/25°C).

Status of inputs and outputs:
Whether the function is active ("|") or not active ("-") is shown for the other components. If a function is switched on with a delay during the relevant phase the remaining delay will be displayed after the relevant function. See picture 3.1 above.

Attention: The status of the inputs is always shown. Even if this input is not activated for the relevant phase.
Attention: If the pulse function for the dosing pump output is activated a "|" will also be displayed next to the deactivated relay.

Status bar:
The lower bar is used to display an exceptional situation (such as a manual stop or the remaining interval time until a rinse) and the current time. The warning corresponds to the phase running at that time. The corresponding phase in § 7 "RO Unit" on page 25 offers further information about any warning there may be.

Menu

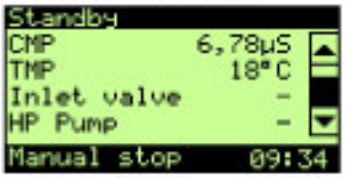
In the menu, the windows have been provided with a unique number in the top right-hand corner.

This can be used to check whether the correct window is selected at all times (in the case of telephone support, for example).

4. General operation

Four keys are used for the operation and programming of this controller.
Details are provided below about the general arrangement of the screen, the meaning of the various "keys" and the general display /input windows.

4.1. Main screen



In the main screen the keys have the following functions:

- ▲ ▼ Navigate between the information window in the main screen.
- ⊖ To the menu.
- ⊜ To the alarm window

4.2. Menu

In the menus the keys may have the following functions:

- ▲ ▼ Navigate through the current menu
- ⊖ Activate the selected option (submenu or window with set values).
- ⊜ Quit the corresponding (sub)menu.

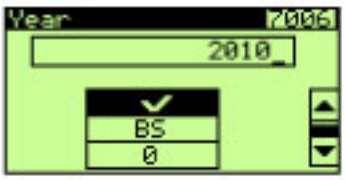
4.3. Window

The various settings can be made in windows.
The different types of settings are: values, texts and dropdown lists.
The ▲ and ▼ keys can be used to navigate between the settings in the windows

4.3.1. Set value or text

The box with the required settings has to be selected to change a value or text.

If the selection bar is on the required box, the setting may be changed by pressing the ⊖ key, thus calling up a new window where the value / text can be changed.



- ▲ ▼ Navigate between the options.
- ⊖ Confirm the choice.
- ⊜ Quit the window without changes

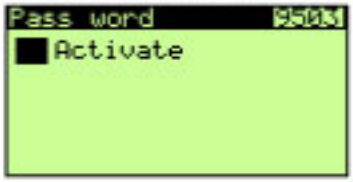
This window invariably has two choices with a special meaning:

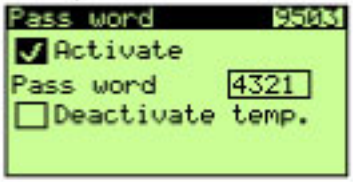
- ✓ Confirm the (changed) setting. You then quit the window.
- BS (Backspace) Erase last character.

The changed setting is stored in the memory after you quit the main menu.

4.3.2. On / off option

The menu features the so-called "on/off" options.





The option can be changed via the ⊖key. If the "check" mark appears the option is switched on. Other settings can be activated and appear by switching on this option.

4.3.3. Set dropdown list

A dropdown list is identified by a field with an arrow pointing downwards on the right-hand side.

If there is a selection bar in this field, the setting can be changed by pressing the ⊖ key, thus calling up a window with a list of options.

⊕ ⊗ Navigate between the options.
⊖ Confirm the choice.
⊜ Quit the window without changes

Confirming the choice calls up another window for the final confirmation.

⊖ Confirm the choice again.
⊜ Cancel the choice.

The changed setting is stored in the memory after you quit the main menu.

4.3.4. Confirmation

In some cases confirmation is required subsequent to a choice or change. The ⊖key can be used to confirm the choice or change. The ⊜ key can be used to cancel the choice or change.

Example:

4.4. Alarm window

The operation in the alarm window is described in § 8.2 "Alarm window" on page 31.

5. Unit Configuration

This chapter describes how the unit may be configured.

The unit configuration option is featured in the main menu.
The main menu may be activated via the ⊖ key after which the bar has to be moved to "Unit" (via the ▼ and ▲ keys) and the ⊖ key pressed again.

Use the ⊖key to quit the windows.

If the unit configuration is selected you will be asked if the unit may be placed in Standby.
The configuration may be accessed only if the unit is in Standby.
Press on the ⊖ key to continue and on the ⊖key to cancel the choice.

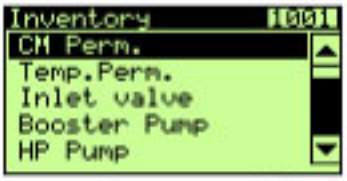
If the unit is placed in Standby the following window will appear where a choice is made between the inventory of the connected components and the programming of the components and the phases of the RO unit.

The inventory first of all has to be made after which the inventoried components are programmed and activated during the RO unit's various process phases.

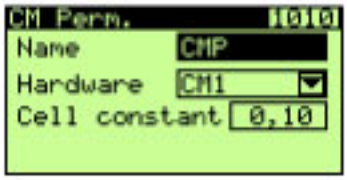
The inventory menu may be secured against unauthorised changes, upon which a key appears after "Inventory" to show the option is secured
(see also § 21.1.2 "Menu" on page 70).

5.1. Inventory

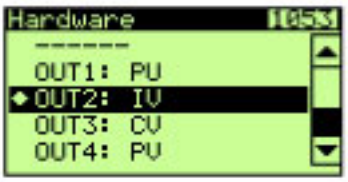
Before the components and process phases can be programmed, an inventory has to be made of the components with the corresponding properties.



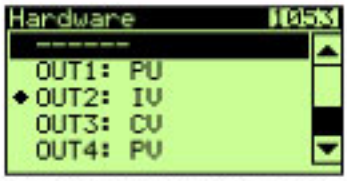
Selecting the item "Inventory" calls up a list of potential components that may be connected. If a specific component from the list is connected to the controller the component's corresponding window can indicate which pins the component is connected to.
The specific properties of a component may also be entered, such as a cell constant or whether a switch is "normally open" or "normally closed".



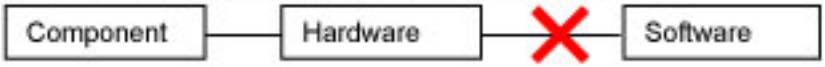
When a component is connected to the controller "Hardware" can show which pins the component is connected to.
An overview is provided of the hardware to which the corresponding component can be connected. It also indicates which hardware is already occupied.



Example:
Inlet valve connected to OUT2.

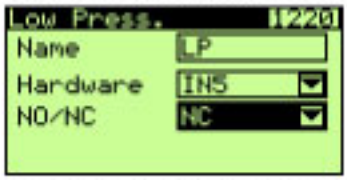


If a component is not connected, then the "----" option should be chosen. This disconnects hardware and software.



The component will then no longer be listed in the remaining settings, unless the component was connected to another component in the settings for that other component. In that case, the text will be "crossed out".

When a component has to be moved to other terminals, where a component is still connected, an automated process has to be used to release the component that is detached. The component can then be connected to the terminals made available.

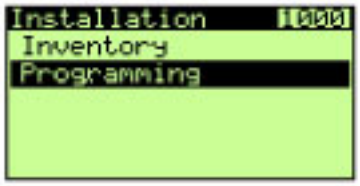


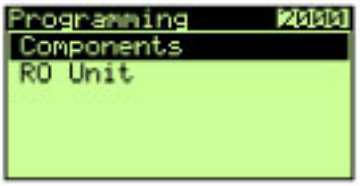
In the case of the digital switches whether this is a "normally open (NO)" or "normally closed (NC)" contact also has to be specified in the inventory.

If an inventory window for a specific component differs from the windows shown here more information about this can be found in the corresponding component in § 6 "Component" on page 11.

5.2. Programming

Subsequent to the inventory of the components and entering the specific properties of the components, you may enter other properties in the component programming and the various phases of the RO unit can be set.





The program menu can be secured against unauthorised changes. A key then appears after "Programming" to show the option is secured (see also § 21.1.2 "Menu" on page 70).

5.2.1. Components

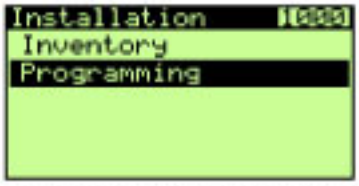
The features of a component can be programmed.

If other settings are required for the component the component is not displayed in the programming list for the components. Nor will a component be displayed in the list if this is not connected (not linked to the hardware)

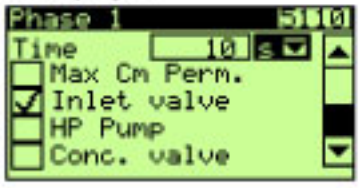
More information about the programming of a component can be found in § 6 "Component" on page 11.

5.2.2. Units (phases)

Once the components have been inventoried and programmed the various process phases of the RO unit may be programmed.



Only the programmable phases will be displayed.



During a "time" phase the time is entered (0-999) in seconds or minutes. If a time of 0 is entered the corresponding phase is omitted.
It may also be shown in each phase which components are activated.
If a component is not displayed this means it is not connected or the component cannot be set for this phase.
More information about the programming of the process phases is featured in § 7 "RO Unit" on page 25.

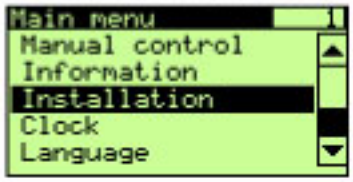
6. Components

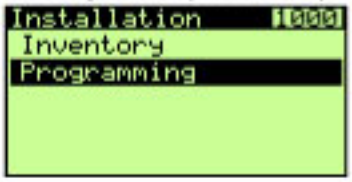
An examination is made in this chapter of the inventory and programming options for the various components that have to be connected.
This component may divided into:

- Valves
- Pumps
- Alarm
- Switches
- Storage tank
- Conductivity meter (including temperature sensor)
- Other

Where a reference is made in this chapter to inventory, this means the window located via the "Installation – Inventory" options. See § 5.1 "Inventory" on page 9 for more information.

Where a reference is made in this chapter to the programming of a component this means the window located via the "Installation – Programming – Components" options.



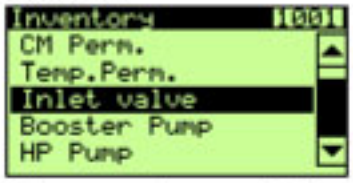


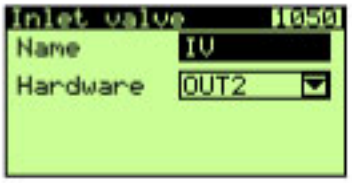
6.1. Valves

The valves may be connected only to the relay output functions (OUT1 to OUT5 / OUT1 to OUTB). Whether a valve is open or closed can also be determined for each process stage.
The "Permeate valves" are alone in having other settings on top of the inventory settings.

6.1.1. Inlet valve

In the case of the "Inlet valve" all that has to be entered, in the inventory, is the relay output it is connected to.

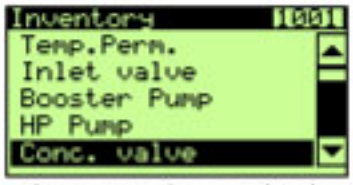


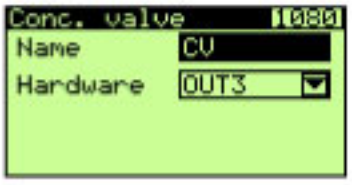


No other properties need to be set.

6.1.2. Concentrate valve

In the case of the "Concentrate valve" all that has to be entered, in the inventory, is the relay output it is connected to.





No other properties need to be set.

6.1.3. Permeate rinse valve

In the case of the "Permeate rinse valve" all that has to be entered, in the inventory, is the relay output it is connected to.

If the permeate rinse valve is connected to a conductivity meter, the valve will be opened or closed during the "Production", phase (if the valve is activated during this phase) depending on the measured conductivity and the settings.

A limit (0-9999) for conductivity can be set in the valve programming, as well as the delays for opening ("Delay on": 0-9999s) or closing ("Delay off": 0-9999s) the valve in the event the set limit is overshot/ undershot.
During all the other phases (other than "Production") the valve will be directly opened or closed at the start of the phase, depending on the setting for the corresponding phase.

If the selected conductivity meter is no longer connected to hardware in the inventory, then the text will be crossed out. Since the conductivity meter is no longer valid, the permeate flush shut-off valve will no longer depend on the selected conductivity meter. The settings are no longer relevant then and will therefore not be displayed.

Attention!
During the production start-up phases (Production 1, 2 and 3) the permeate rinse valve will also invariably be opened or closed independently of the conductivity.
During the "Standby" phase the rinse valve will be open by default.

6.1.4. Permeate block valve

The inventory and programming screens are identical to the screens which can be seen at the permeate rinse valve (see § 6.1.3 "Permeate rinse valve" 12). In the inventory the screen number needs to be increased by 2, and in the programming by 5.

During the "Production" phase and "Standby" phase, the permeate block valve will function differently from the permeate rinse valve. During "Production" the valve will be opened if the measured conductivity is below the set limit value. During "Standby" the valve will be closed.

6.1.5. Permeate 3-way valve

The inventory and programming screens are identical to the screens which can be seen at the permeate rinse valve (see § 6.1.3 "Permeate rinse valve" 12). In the inventory the screen number needs to be increased by 2, and in the programming by 5.

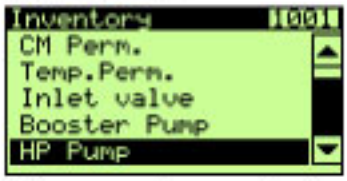
During the "Production" phase the valve will be closed in the rinsing direction if the measured conductivity is below the set limit value.
During "Standby" the valve will be opened in the rinsing direction.

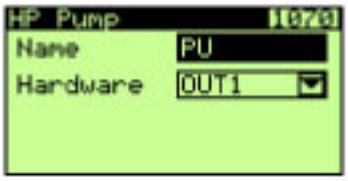
6.2. Pumps

The pumps may be connected only to the relay outputs (OUT1 to OUT5 / OUT1 to OUTB).
Whether a pump is switched on or off can also be determined for each process stage
The dosing pump is alone in having other settings on top of the inventory settings.

6.2.1. High pressure pump

In the case of the “High pressure pump” all that has to be entered, in the inventory, is the relay output it is connected to.

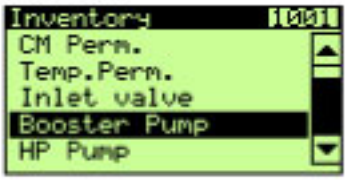




No other properties need to be set.

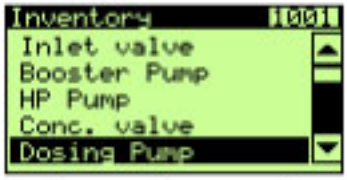
6.2.2. Booster pump

In the case of the “Booster pump” all that has to be entered, in the inventory, is the relay output it is connected to.

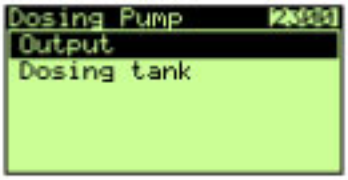


6.2.3. Dosing pump

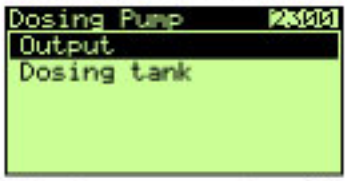
In the case of the “Dosing pump” all that has to be entered, in the inventory, is the relay output it is connected to.

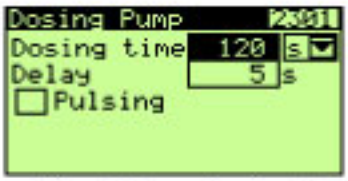


The subsequent programming of the dosing pump allows a dosing time to be set between 0 and 9999 (seconds or minutes). When a dosing time of 0 is entered the dosing pump is switched on until the end of the phase.



The controls of the dosing pump (“Output”) can be adjusted and connected to a dosing tank in the programming of the dosing pump.

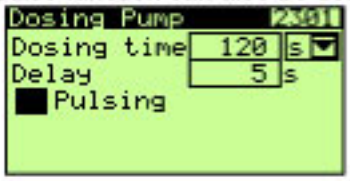


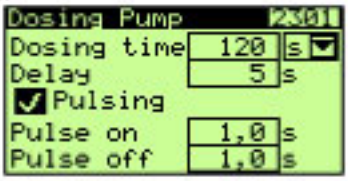


The dosing pump can be switched on with a delay, after the start of the phase. A delay of 0 to 9999 seconds can be entered.

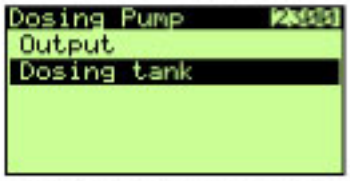
Attention!
If the dosing pump is activated in successive phases (such as phase 1 to phase 2 or from the "Production" phase to the "Rinse" phase), the switch-on delay and dosing time will not be reset during the start of next phase.
See § 7 "RO Unit" on page 25 for the activation of the dosing pump during the phases.
For example: § 7.1 RO Unit – Production – Phase 1 – Dosing pump.

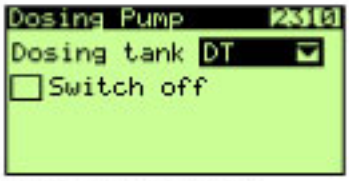
A pulse function can also be defined.

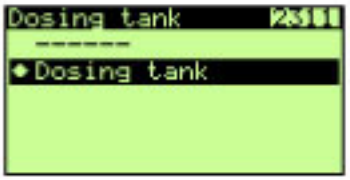




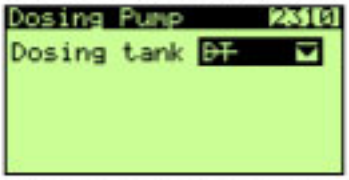
During the set dosing time pulses are provided as set ("Pulse on": 0.5 – 999.9 seconds / "Pulse off": 0.5 – 999.9 seconds).







You can connect the proportioning pump to a dosing tank.
You can indicate the connection in this menu and also whether the proportioning pump needs to be turned off when the dosing tank detects a low level.

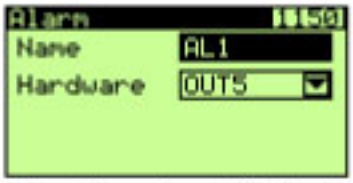


If no level switch is connected to an input (IN1 t/m IN5) for the selected dosing tank in the inventory, then the text will be crossed out. Since the dosing tank is no longer valid, the dosing pump will no longer depend on the selected dosing tank. The settings will no longer be relevant and will therefore not be displayed.

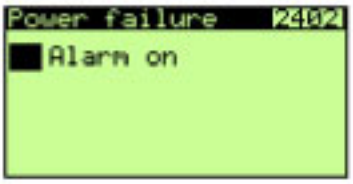
6.3. Alarm

An alarm output may be connected only to a relay output function (OUT1 to OUT5 / OUT1 to OUTB). Activation of the relay is completely independent of the phase the unit is in.

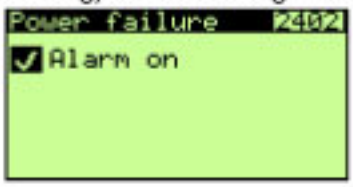
In the case of the "Alarm output" all that has to be entered, in the inventory, is the relay output it is connected to.

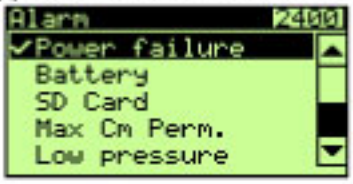


The situation in which the output is activated can be set in the alarm output-related programming.

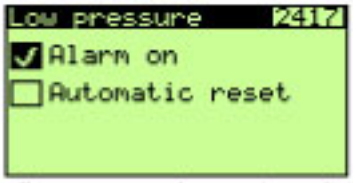


If a component is not connected or a monitoring is not activated (such as minimum conductivity monitoring) the monitoring will not appear in this alarm overview list either.





If the monitoring is activated, a check mark ☑ will be shown in front of the corresponding monitoring in the list.



If a monitoring is activated ("Alarm on"), you may choose to switch the alarm output off again automatically ("Automatic reset"), if the alarm situation is removed.
In some cases there is no point in automatically switching off the alarm output nor is there any need to do so. Examples of this are a power failure or maintenance, when the option for an automatic cut-out is not displayed.

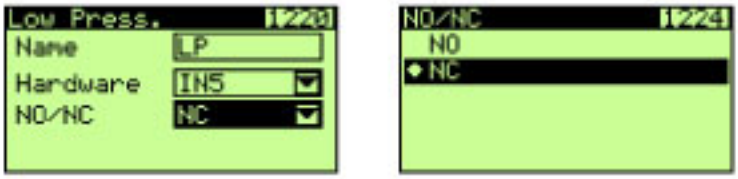
The alarm output may also be switched off manually. See § 8 "Alarms" on page 31 or via an external switch where appropriate. See § 6.4.10 "Alarm reset" on page 18.

Attention!
Alarm messages "ROM settings" and "Default settings".
An alarm is always given when there is a fault in the configuration file. This cannot be set.
In that case the controller has to be reset or a back-up has to be loaded via the boot software.
See § 17 "Hard disk" on page 5325 "Boot software" on page 73.

6.4. Switches

Switches (e.g. level switches) may be connected only to the digital inputs (IN1 t/m IN5).
Whether the input is monitored or not monitored can also be determined for each process stage.

In the case of the switches, the input this is connected to also has to be entered in the inventory.
Whether the switch "is "normally closed (NC)" or "normally open (NO)" also has to be entered.



Example for a "Low pressure" switch.

All switches have other settings on top of the inventory settings, such as a delay on the monitoring. An examination is made in following sections of what the function of the switches is, how the controller will react and what settings are available.

If a monitoring on a switch is switched on during a process the process will be controlled during this time and if the switch is still active after a delay (that can be set) the unit is switched off. The exception to this is the "Alarm reset" switch. This does not affect the process but only the alarms.

Attention!
The switches in the storage tank (high and low level) are not covered here. These correspond to the "Storage tank" component.

6.4.1. Low pressure

The "Low pressure" switch is used to check if there is enough water on the input side.
This function can be used to make a number of programming attempts for recovery. In this case the unit will automatically be switched on again after a programmable interval time. The number of attempts is always kept. If the number of programmed attempts is executed during a process, the unit will be switched off and can then only be switched on manually.

If the number of attempts is set at 1 the unit will not be switch on automatically.
At the end of a phase ("Production", "Rinse", etc...) the number of attempts is reset at the programmed value.

For information about the inventory see § 6.4 "Switches" on page 16.

A delay (0-9999 seconds) and the number of attempts (1-9) can be entered in the window. If the number of attempts is set at 2 or more the interval time between the attempts can entered (1-99 minutes).

6.4.2. Exceeded pressure

The "Exceeded pressure" switch may be placed at a position where an overpressure has to be controlled. This switch is generally placed between the high pressure pump and the membrane. The "Pressure before Membrane", "Pressure after Membrane" and "Pressure permeate "switches may be used in the event an overpressure control has to be made at several positions in the unit.

If the unit is switched off after an overpressure situation these can only be switched on again manually.
For information about the inventory see § 6.4 "Switches" on page 16.

A further delay may be entered (0-9999 seconds) for the monitoring.

6.4.3. Pressure before membrane

The "Pressure before Membrane" switch is placed between the high pressure pump and the membrane. The inventory and programming is the same as for the "Exceeded pressure" switch. See also § 6.4.2 "Exceeded pressure" on page 16.

6.4.4. Pressure after membrane

The "Pressure after Membrane" switch is placed in the concentrate line after the membrane. The inventory and programming is the same as for the "Exceeded pressure" switch. See also § 6.4.2 "Exceeded pressure" on page 16.

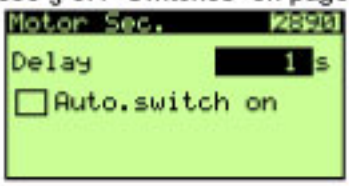
6.4.5. Pressure permeate

The "Pressure permeate" switch is placed in the permeate line after the membrane.
The inventory and programming is the same as for the "Exceeded pressure " switch.
See also § 6.4.2 "Exceeded pressure" on page 16.

6.4.6. Motor security

The "Motor security" switch function is used to connect a thermal protection or motor security switch. In the programming, it can be set whether the installation must be switched on automatically or manually when the malfunction has been remedied.

For information about the inventory see § 6.4 "Switches" on page 16.

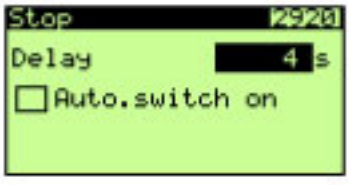


A further delay can be entered (0-9999 seconds) for the monitoring. You may also indicate if the unit is automatically switched on ("Auto.switch on"), when the malfunction has been remedied, or the unit has to be switched on manually.

6.4.7. Stop

The "Stop" switch function may be used for various purposes.
The programming can be set to show if the unit has to be switched on automatically or manually, when the malfunction has been remedied.

For information about the inventory see § 6.4 "Switches" on page 16.



A further delay can be entered (0-9999 seconds) for monitoring. It can also be specified if the unit is automatically switched on, when the malfunction has been remedied, or the unit has to be switched on manually.

6.4.8. Concentrate

The "Concentrate" switch is used to connect a flow control switch in the concentrate line, which monitors the concentrate flow.

This function can be used to program a number of attempts for recovery. In this case, the unit will be switched on again automatically after a programmable interval time. The number of attempts is always kept. Should the number of programmed attempts be executed during a process, the unit will be switched off and can be switched on only manually.
If the number of attempts is set at 1 the unit will not switch on automatically.
At the end of a phase ("Production", "Rinse", etc...) the number of attempts is reset to the programmed value.

For information about the inventory see § 6.4 "Switches" on page 16.

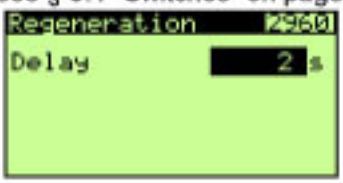
A delay (0-9999 seconds) and the number of attempts (1-9) can be entered in the window. If the number of attempts is set at more than 2 the interval time between the attempts can be entered (1-99 minutes).

6.4.9. Regeneration

The "Regeneration" switch can be used to show that a (simplex) water softening system is regenerating. The RO unit will be stopped and switched into the "Regeneration" phase. See § 7.7 "Regeneration" 29 for more information about this phase.

If the switch is no longer activated, the unit wll automatically return from the "Regeneration" phase to the interrupted phase.

For information about the inventory see § 6.4 "Switches" on page 16.



A further delay can be entered (0-9999 seconds) for monitoring.

6.4.10. Alarm reset

The "Alarm reset" switch can be used for an alarm output to be switched off remotely.
The red LED alarm is not switched off in this case.

The switch does not affect the unit's process run.

For information about the inventory see § 6.4 "Switches" on page 16.

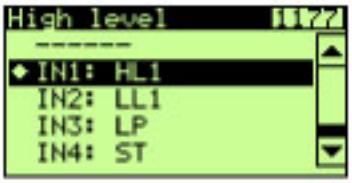
A further delay can be entered (0-9999 seconds) for monitoring.

6.5. Tanks

6.5.1. Storage tank

Two level switches may be placed in a storage tank. A high-level switch (HL) and a low-level switch (LL).

For the inventory the level switch that is connected can be indicated.

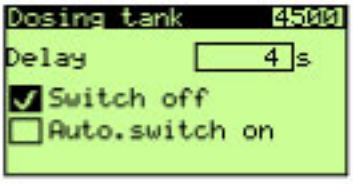


If both level switches are not connected the unit may only be switched manually in the "Production" phase.
If both switches are connected the unit will be switched in the "Production" phase as soon as the low-level switch is active. The unit will quit the "Production" phase again as soon the high-level switch is active.
If both switches are active (owing to a faulty connection, cable cut or defect in one of the switches) the high-level switch has the highest priority and the unit will switch off.

If only a high-level switch is programmed, the storage tank programming can be used to set a delay before the unit is switched on in the "Production" phase. If the high-level switch is active the unit will move directly out of the "Production" phase. In all other cases no delay has to be set while the storage tank does not appear in the list of components with programmable settings.

6.5.2. Dosing tank

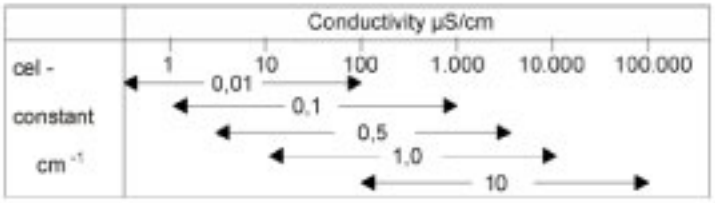
It is possible to have one level switch in a dosing tank (low level).
Please indicate at which exit the level switch should be connected during the inventory.



You can secure the low-level switch by entering a delay of 0-9999 seconds. Also, it is possible to indicate whether the unit must be switched off when the level in the dosing tank is too low. When the unit is turned off, you can have the unit turn on automatically when the dosing tank is filled up to a sufficient level.

6.6. Conductivity meter

A conductivity measurement cell may be connected to the controller. The controller has a facility for automatic switching between two measurement ranges. The measurement ranges are dependent on the sensors used and can be set from very pure water under 1 µS/cm to very saline water up to 100 mS/cm.



Calculating the measurement range:

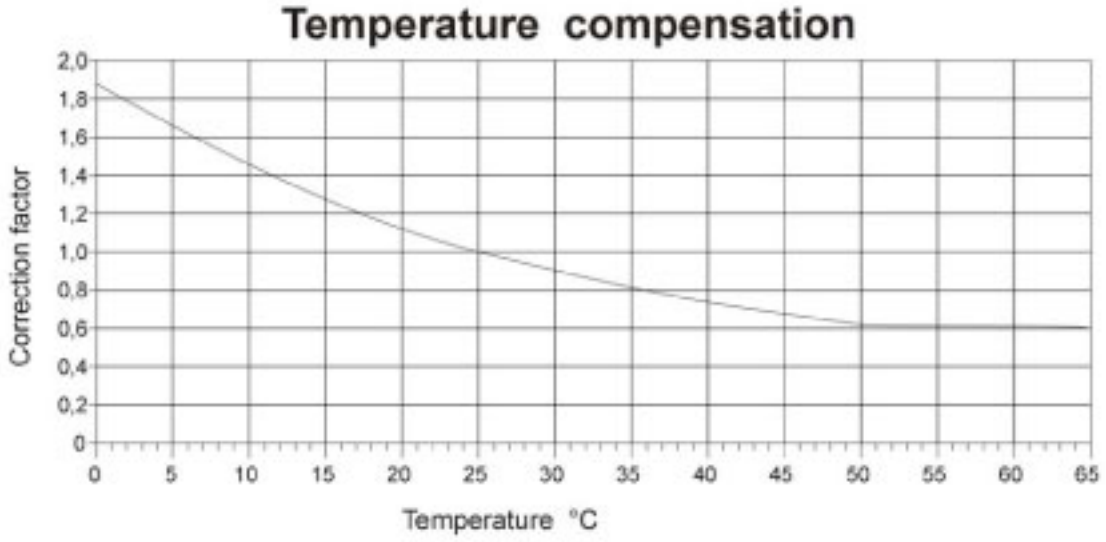
$range_{min}$ = *cell constant * 10 µS / cm*
$range_{max}$ = *cell constant * 10 000 µS / cm*

A lower limit can be set for the function control of the conductivity measurement and an upper limit can be programmed for the water quality control. The delay time for any alarm can be programmed. There is also a setting for indicating whether the unit has to be switched off in these cases and automatically switched on again as soon as the conductivity is restored.

A temperature sensor can be used for the automatic temperature compensation of the conductivity measurement. If no temperature sensor is connected, the manually set temperature is kept.
If a temperature of 25 °C is entered the correction factor is equal to 1 and there is no subsequent correction of the conductivity value.

A PT1000 temperature sensor has to be used.

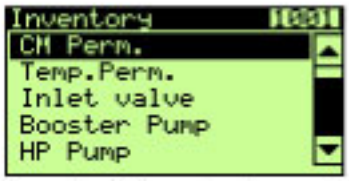
If a temperature sensor is used the measured conductivity value can be automatically corrected. The temperature-dependent correction factor used for automatic or manual compensation can be obtained from the graph below.

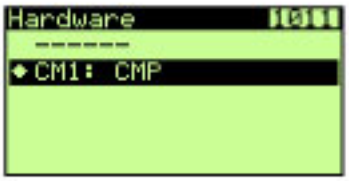


Example:

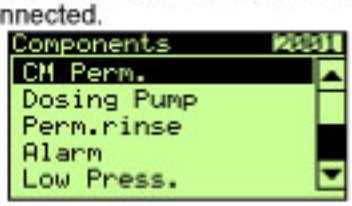
Set/measured water temperature:	T = 12 °C
Measured conductivity values:	C_{12} = 100 µS/cm
Correction factor used:	K = 1,4
Displayed conductivity value:	C_{25} = 140 µS/cm

A conductivity measurement cell may be connected only to a conductivity meter input (CM1). In the inventory you can indicate if the conductivity measurement cell is connected and what the sensor cell constant is.





The conductivity meter has extensive programming options.
In addition to the conductivity measurement and monitoring-related settings, the temperature-related settings will also appear. The temperature measurement is connected to the conductivity measurement and the settings are relevant only if the conductivity measurement cell is also connected.



The window for the conductivity measurement-related settings is again divided into:

- Properties (conductivity measurement properties)
- Temperature (temperature compensation)
- Monitor Min. (monitoring of the minimum conductivity)
- Monitor Max. (monitoring of the maximum conductivity)

6.6.1. Properties conductivity measurement

In this window you can set if the measurement value needs to be displayed in µS/cm or in TDS (ppm). If the unit is set at TDS a factor can be entered (0.50-1,00). A correction to the measured value can also be set (0.01-5,00).

6.6.2. Temperature

A link can be made to a temperature measurement in the screen above whereby the measured conductivity value is compensated for in terms of temperature. If there is no link is to a temperature measurement, then the temperature can be compensated for by means of a hand-operated value.

6.6.3. Monitoring minimum conductivity

An electrical interruption of the sensor, electrical faults in the system or air in the sensor can erroneously result in very low conductivity. For monitoring purposes a minimum limit of 0.1 to 1000.0 µS/cm can be entered.

A delay can also entered (1-9999 sec). During the delay the measured value has to be under the limit so an alarm is given if the unit is switched off.

You can set if the unit actually is switched off ("Switch off").

If the monitoring is not switched on ("Monitor") the monitoring will not appear in the programming list of phases.

6.6.4. Monitoring maximum conductivity

A change to the quality of the supply water or a defective membrane can lead to a change in the water conductivity. For monitoring purposes the maximum limit of 0.2 to 10.000,0 µS/cm can be entered.

A delay may also be entered (1-9999 sec). During the delay the measured value has to be under the limit so an alarm is given if the unit is switched off.

You can set if the unit is actually switched off ("Switch off").

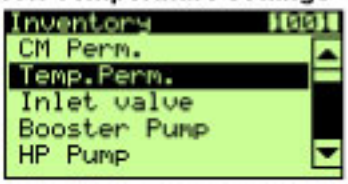
If the monitoring is not switched on ("Monitor") the monitoring will not appear in the programming list of phases.

6.7. Temperature meter

A temperature sensor can be connected to the controls. This can be linked to a "conductivity cell" for a temperature compensation of the measured conductivity value (see § 6.6.2 "Temperature" on page 21).

Attention:
The temperature sensor must be of the PT1000 type.

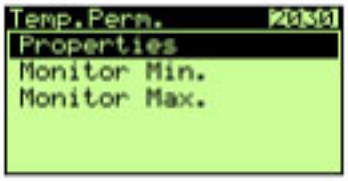
6.7.1. Temperature settings



The temperature sensor can be linked to the temperature input (TM1).

The temperature sensor must be of the PT1000 type..

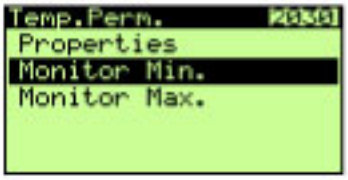
6.7.2. Temperature measurement properties



This window can be used to indicate how the unit of temperature can be specified (°C or °F).

6.7.3. Monitoring minimum temperature

For minimum temperature monitoring purposes a minimum limit of 1 to 99 °C can be entered.



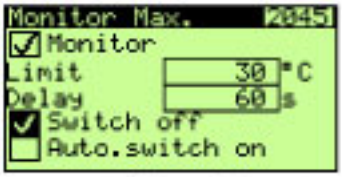
A delay can also be entered (1-9999 sec). During this delay, the measured value has to be below the limit so an alarm is given if the unit is switched off.

You can set if the unit is actually switched off ("Switch off"). If this is the case you may set if the unit should be automatically switched on again ("Auto. switch on") should the measured value rise above the limit once more.

If the monitoring is not switched ("Monitor") the monitoring will not appear in the programming list of phases.

6.7.4. Monitoring maximum temperatures

For monitoring maximum temperature purposes a maximum limit of 1 to 99 °C can be entered.



A delay can also be entered (1-9999 sec). During this delay, the measured value has to be below the limit so an alarm is given if the unit is switched off.

You can set if the unit is actually switched off ("Switch off"). If this is the case you may set if the unit should be automatically switched on again ("Auto. switch on") should the measured value rise above the limit once more.

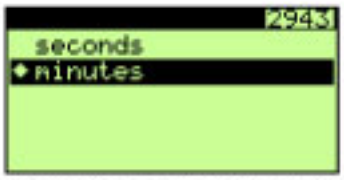
If the monitoring is not switched ("Monitor") the monitoring will not appear in the programming list of phases.

6.8. Additional

6.8.1. Additional program

In the case of the "Additional program" the inventory has to specify the relay output this is connected to.

During the subsequent programming of the additional program a time duration can be set between between 0 and 9999 (seconds or minutes). If a time of 0 is entered the additional program will be switched on until the end of the phase.



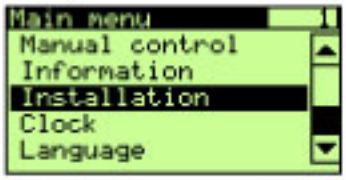
The additional program can switched on with a delay, after the start of the phase. A delay of 0 to 9999 seconds can be entered.

Attention!
If the additional program is activated in successive phases (such as phase 1 to phase 2 or from the "Production" phase to the "Rinse" phase), the switch-on delay and dosing time will not be reset during the start of the next phase.
See § 7 "RO Unit" on page 25 for activating the additional program during the phases.
For example: § 7.1 RO Unit – Production – Phase 1 – Add.Program.

7. RO Unit

This chapter will examine the various phases of the RO unit.

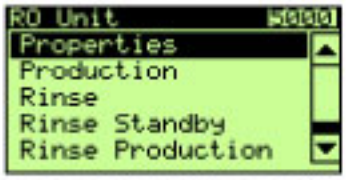
The programming for the RO phases can be reached via the following windows by continuing to press the ⊖key.

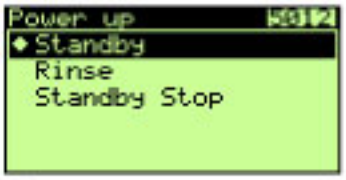


You may quit the windows via the ⊖key.
The manual control opportunities are explained in § 9 "Manual operation of the unit " on page 33.

7.1. Properties

The general characteristics with regards to the installation can be set in this window.





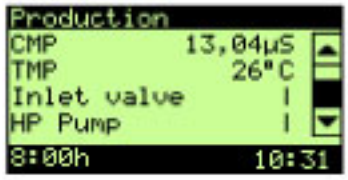
It can be set in which phase the controls must start after a power failure.

7.2. Production

During the "Production" phase the unit provides treated water: the untreated water generally flows via the inlet valve to the high-pressure pump and then to the osmosis module. A stream of water (concentrate) concentrated with salt flows via the concentrate regulating valve into the sewer. The stream of water, the desalinated water (permeate), flows into a storage tank / consumption points. Possible installation options include multistage installations, concentrate return or permeate discharge valve, which are activated depending on the conductivity.

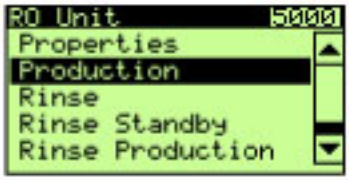
The production of desalinated water can be launched depending on the level switch (s) (HL and LL) or manually. During production a service hour counter will be kept which can be read off under the menu option "Information" (see § 10.5 "Counters" on page 36). A counter will also be kept in connection with maintenance, if this is programmed (see § 20.2 "Maintenance" on page 65)). This can be read off in the same window as the service hour counter.

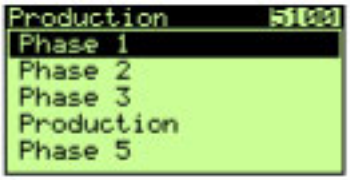
During the "Production" phase the unit may be switched off manually, irrespective of the status of the level switches in the storage tank. The unit will go into the "Rinse" phase (if programmed) or the "Standby " phase. The lower bar in the main window will then show if the unit has been switched off manually. The unit will then no longer be switched on automatically until the unit has been switched on manually again (see also § 9 "Manual operation of the unit " on page 33).

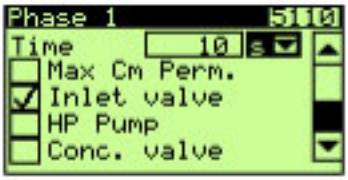


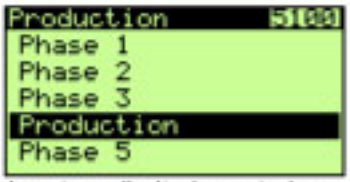
If the "Rinse during Production" phase (see § 7.5 "Rinse during production" on page 27) is activated, the lower bar will show the time remaining until the next rinse. The time is counted in minutes. If the remaining time is under one minute, the time will be counted in seconds.

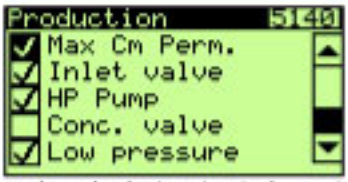
Prior to the "Production" phase a max. of 3 stages (with a time duration) can be entered (Phase 1, 2 and 3). Subsequent to the "Production" phase 1 stage can be entered to switch over to the "Rinse" phase or to the "Standby" phase (Phase 5).









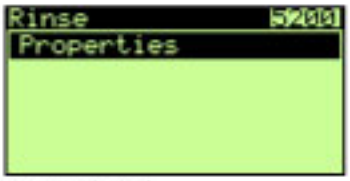


For each stage you can enter what inputs or limits have to be monitored and what outputs have to be activated. A time has to be entered (0-9999 seconds / minutes) in phases 1, 2, 3 and 5.
If a time of 0 is entered the corresponding phase will be omitted.

Attention!
If a permeate valve is connected to a conductivity meter, the valve will be opened or closed during the "Production" phase, depending on the measured conductivity and the settings, if the valve is activated during this phase (see also § 6.1.3 "Permeate rinse valve" on page 12.

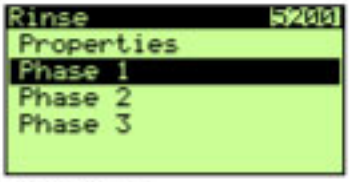
7.3. Rinse (after production)

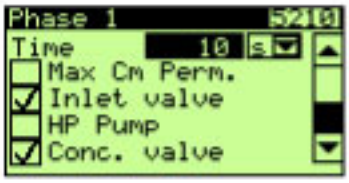
The "Rinse" phase is used, for example, for the displacement of the concentrate after the end of the production cycle. This phase may comprise a max. of 3 stages, each with a time duration of 0-9999 seconds / minutes.



Rinse not activated

If no rinsing is required after the "Production" phase the phase may be omitted by turning the phase switch off (no check mark in "Activate"). If the phase is activated the various stages can be programmed





Rinse not activated

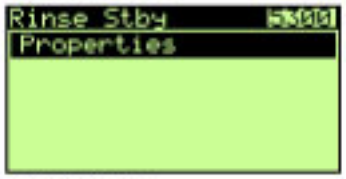
For each stage you can enter what inputs or limits have to be monitored and what outputs have to be activated and the time duration of the phase (0-9999 seconds / minutes).
If a time of 0 is entered the corresponding phase will be omitted.

Warning!
Rinsing can only be stopped manually and cannot be controlled by adjusting the level switches.

7.4. Rinse during Standby

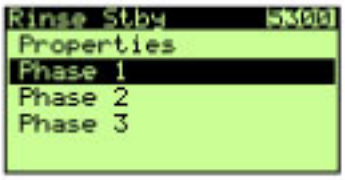
The "Rinse during Standby" phase is used, for example, to prevent the modules being affected by bacterial growth during a long "Standby" phase.

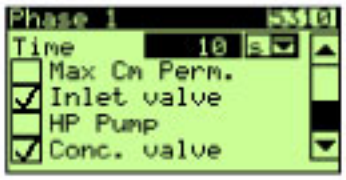
The rinse may comprise a max. of 3 stages each with a time duration of 0-9999 seconds /minutes.



Rinse not activated

If no interval rinse is required during the "Standby " phase this phase may be omitted by switching the phase off (no check mark in "Activate"). If the phase is activated the various stages may be programmed and an interval time may be entered (1-9999 minutes / hours).





Rinse activated

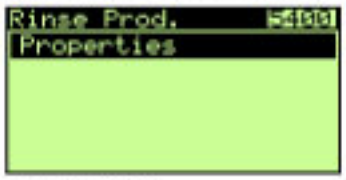
For each step you can enter which inputs of limits are monitored, which outputs have to be activated and the time duration of the phase (0-9999 seconds / minutes).
If a time of 0 is entered the corresponding phase will be omitted.

Warning!
Rinsing can only be stopped manually and cannot be controlled by adjusting the level switches.

7.5. Rinse during production

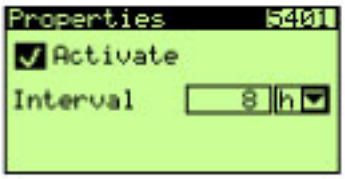
The "Rinse during production" phase is used, for example, to apply a further rinse during a lengthy production cycle if the water is heavily contaminated.

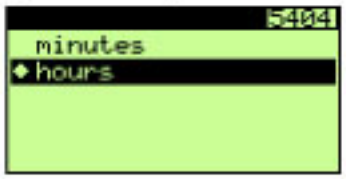
The rinse may comprise a max. of 3 stages each with a time duration if 0-9999 seconds /minutes.

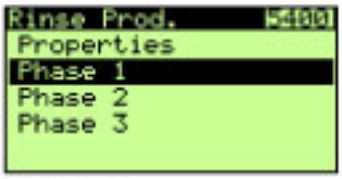


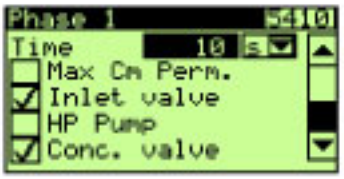
Rinse not activated

If no interval rinse is required during the "Production" phase this phase may be omitted by switching the phase off (no check mark in "Activate"). If the phase is activated the various stages may be programmed and an interval time may be entered (1-9999 minutes / hours).









Rinse activated

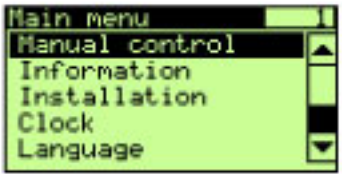
For each stage you can enter which inputs of limits are monitored, which outputs have to be activated and the time duration of the phase (0-9999 seconds / minutes).
If a time of 0 is entered the corresponding phase will be omitted.

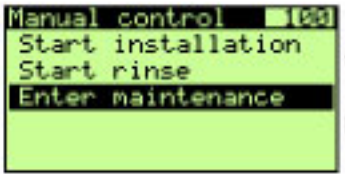
Warning!
Rinsing can only be stopped manually and cannot be controlled by adjusting the level switches.

7.6. Maintenance

The "Maintenance" phase can only be switched on and off manually, in order to clean the membrane with special solutions, for example.

§ 20.2 "Maintenance" on page 65 describes how the "Maintenance" phase can be activated.
If this is not activated the phase will not appear in the RO Unit list with phases and cannot therefore be programmed.

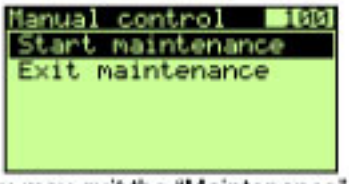


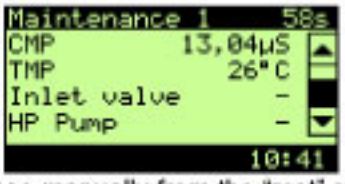


If the phase is activated this can be switched on manually ("Enter maintenance") from the "Standby" phase.

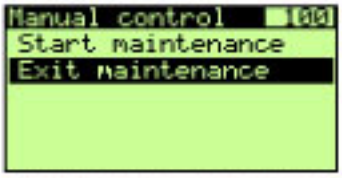
A "rest" stage will first of all be switched on.

The actual maintenance can then be started and stopped manually
("Start maintenance" / "Stop maintenance").

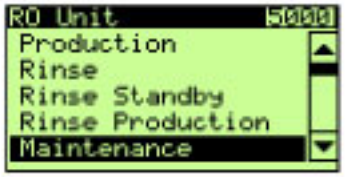


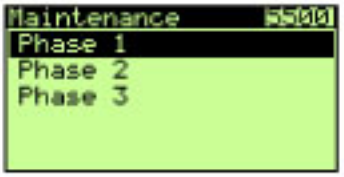


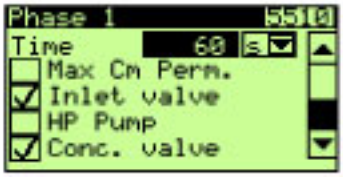
You may quit the "Maintenance" phase manually from the "rest" stage ("Exit maintenance").



The maintenance may comprise a max. of 3 stages each with a time duration of 0-9999 seconds / minutes.







For each stage you can enter which inputs or limits are monitored, which outputs have to be activated and the time duration of the phase (0-9999 seconds / minutes).
If a time of 0 is entered the corresponding phase will be omitted.

7.7. Regeneration

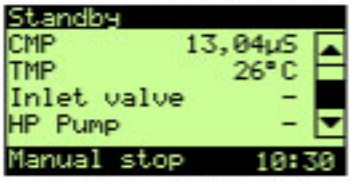
The “Regeneration” phase can be used to show that a water softening system is in regeneration. This phase can be activated only if a switch “Regeneration” is configured
(see § 6.4.9 “Regeneration” on page 18).

No settings can be programmed for the “Regeneration” phase, while all RO process-related functions are switched off, except “Regeneration” switch monitoring.
The level switches monitoring is also switched off.

The unit is automatically switched on again as soon as the “Regeneration” switch is no longer active

7.8. Standby

No settings can be programmed for the “Standby” phase while all RO process-related functions are switched off, except level switches monitoring. If the unit is not automatically switched on at the level switches the unit may be manually switched off and has to be switched on manually again.
(see also § 9 “Manual operation of the unit ” on page 33).



If the unit is manually switched off this is shown in the lower bar of the main screen (“Manual Stop”).

If the “Rinse during Standby” phase (see § 7.4 “Rinse during Standby ” on page 27) is activated the lower bar will show the time remaining until the next rinse.
The time is counted in minutes. If the remaining time is less than one minute the time is counted in seconds. If the unit is manually switched off rinsing will not take place.

7.9. Standby Stop

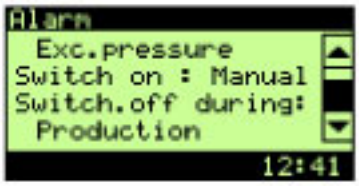
The controller is routinely delivered in the “Standby Stop” phase. The unit will not start up automatically until this is manually switched on (see § 9.1 “Standby stop” on page 33). Once it is switched on, subsequent to a power failure the controller will no longer start up in this phase, unless this is activated via the programming prior to the power failure (see § 7.1 “Properties” on page 25).

Even after new software is installed, the “Standby stop” phase will be activated until the unit is switched on manually.

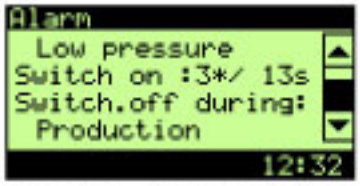
7.10. Alarm

No settings can be programmed for the "Alarm" phase while all RO process-related functions are switched off, except the monitoring on which the RO process is interrupted.
The level switches monitoring is also switched off.

Depending on the settings the unit will switch on automatically or it has to be switched on manually.



The top bar in the main window shows that the "Alarm" phase is activated. Also shown is the cause of the alarm, the way the unit switched on again and the phase, which is interrupted by the alarm situation.



In the case of low pressure or concentrate flow alarm the unit can be automatically switched on after an adjustable interval time (depending on the settings, see § 6.4.1 "Low pressure" on page 16 and § 6.4.8 "Concentrate" on page 18). The window shows the remaining number of attempts and the remaining interval time until the next attempt. When the set number of attempts is reached, this will be shown "Switch on : 0*". In that case the unit has to be switched on manually.
The remaining interval time is displayed in minutes until the remaining time is less than 1 minute, when there is a changeover to a display in seconds.

8. Alarms

The controller features various monitorings of both the operation of the RO unit and the operation of other functions in the controller (such as the SD card function).

8.1. General overview

The alarms can be recorded via an SD card, via e-mail or via an RS485 connection. The way the recording operates and can be set is described in § 14.4.1 "Alarm log function" on page 47 and later on in the chapter for the corresponding medium:

SD Card : § 14.4 "Log functions" on page 47.
E-mail : § 15.2 "Log functions" on page 50.
RS485 : § 16.2 "Log functions" on page 51.

An alarm output can also be used to provide a warning. A lamp or a buzzer may be activated, for example. § 6.3 "Alarm" on page 15 features a description of the alarm output options and settings.

The "Information" option in the menu can be used to view the last 20 alarms. In this case the date and time are recorded as well as a short description of the alarm, while it is shown whether the alarm situation is active at that time or has been removed. See § 10.6 "Alarm history" on page 36 for more information.

If the RO unit's operation is interrupted by an alarm situation, this will be shown in the main window, which will indicate the cause of the alarm situation, and the phase interrupted by the alarm situation. See § 7.10 "Alarm" on page 30 for more information.

Attention!
In the event of a fault in the configuration file with programming an alarm is invariably given. This cannot be set. In this case the controller has to be reset or a back-up may be uploaded via the boot software, if need be.

8.2. Alarm window

An alarm is given in the alarm window, showing the date and time.
The window can be activated via the main window by pressing the ⊜ key.

The keys then have the following function:
▲ ▼ Navigate through the alarms
⊜ Quit the alarm window.
⊖ The alarm output and red LED can be switched off with this. The corresponding warning can also be deleted from the list with this.

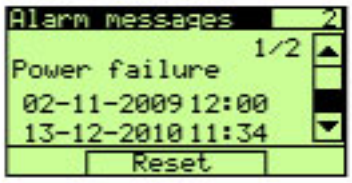
When an alarm output is programmed and activated, this output can be switched off with ⊖ key. The red LED will also be switched off.

The warning can be deleted from the overview, if the cause of the alarm situation has been removed, by proceeding to the corresponding warning and pressing the ⊖ key again.

The warning remains in the overview when the corresponding monitoring is programmed so that the alarm output automatically switches off when the alarm situation is removed. The warning can be deleted by going to the corresponding warning in the alarm window (via the ▲ and ▼ keys) and pressing the ⊖ key.

An alarm, in the alarm window takes the following form:

The window provides the following information:
- line 1 : x/y x = number of the warning, y = number of warnings
- line 2 : brief description of the alarm situation given.
- line 3 : date and time when the alarm occurs
  If "uu-uu-uuuu" and/or "uu:uu" is displayed here, then the clock did not get a valid value at the moment (after replacing the battery, for example).
- line 4 : date and time when the alarm is removed
  If the alarm has not yet been removed this is shown by "***".



For example, it is possible to read off in the window the date and time the controller is switched off (line 3) and when it is switched on again (line 4).

8.3. Overview alarms

Shortened display	Description
Concentrate	The concentrate flow control switch is active after the set delay.
Default settings	The configuration files on the hard disk are disabled or unavailable The controller has to be configured again or a back-up loaded.
Backup settings	The last programming changes are not stored. The previous programming is loaded. Check the parameters or load an back-up through a SD Card.
Language file	The language file cannot be read. The English language will be loaded. You can load a backup through a SD Card.
Font file	The font file cannot be read. The standard font will be loaded. You can load a backup through a SD Card.
Multiple files	Multiple files can not be read. You can load a backup through a SD Card.
Press. after Mem.	The pressure switch after the membrane is active after the set delay.
Press. Permeate	The pressure switch in the permeate line is active after the set delay.
Press for Mem.	The pressure switch for the membrane is active after the set delay.
Email	A fault occurred when sending an e-mail.
Low pressure	The low pressure switch is active after the set delay.
Max. CM Perm.	Maximum conductivity limit exceeded.
Max. Temp. Perm.	Maximum temperature limit exceeded.
Min. CM Perm.	Minimum conductivity limit undershot.
Min. Temp. Perm.	Minimum temperature limit undershot.
Motor security	The motor security switch is active after the set delay.
Maintenance	Maintenance has to be undertaken on the unit.
Exc. pressure	The overpressure switch is active after the set delay.
Regeneration	A regeneration has started. RO Unit activity was interrupted.
ROM settings	The configuration files on the hard disk are disabled or unavailable. The controller has to be configured again or a back-up loaded.
SD: Software Card	The SD card is not appropriate for the data logging or a back-up. The SD card contains original software or "OEM" software.
SD: Card full	Not enough disk space on the SD card
SD: Not present	No SD card available or this does not comply with the specifications.
Stop	The stop switch is active after the set delay.
Power failure	The controller has been switched off.
Battery	Battery Low(replace battery) or battery was outside holder.
Set clock	The clock must be set at a valid date/time.

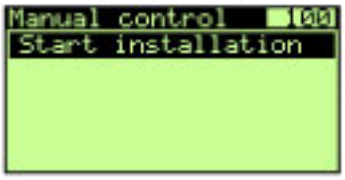
9. Manual operation of the unit

The unit can be controlled manually.

The main menu's "Manual control" features an overview of the manual operations possible at that time.
The window with the options can be opened via the ⊖ key.

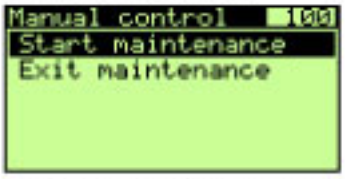
The options for each phase are shown below.

9.1. Standby stop

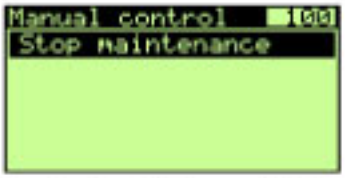


During the "Standby Stop" phase the unit is at a standstill and is not activated until the unit is manually switched on. This window can be used to switch on the unit.

9.2. Maintenance



The "Maintenance" phase can be divided into "non-active" status and "active" status.
During "non-active" status the following actions can be applied:
- Start actual maintenance (active status) via "Start maintenance"
- Quit maintenance via "maintenance"
  You return to the Standby phase.



During "active" status only this status can be stopped ("Stop maintenance").

9.3. Standby

Various actions can be applied during the "Standby " phase.

- Start production via "Start installation"
  This option is not shown if there are level switches and the storage tank is full.
- Start "Rinse during Standby " phase via "Start rinse"
  This option is not shown if the "Rinse Standby " phase is not activated or if the unit is manually stopped during production.
  See § 7.4 "Rinse during Standby " on page 27.
- Start maintenance via "Enter maintenance"
  This option is not shown if the maintenance is not activated or is secured.
  See § 7.6 "Maintenance" on page 28 and § 21.1.3 "Process" on page 70.

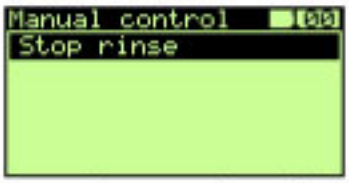
9.4. Production

Various actions can be applied during the "Production" phase.
- Stop production via "Stop installation"
  If there are level switches and the storage tank is empty a warning will appear in the main window to show the unit is manually stopped ("Manual stop").
  The unit has to be switched on again manually.
- Start "Rinse during Production" phase via "Start rinse"
  This option is not shown if the "Rinse during Production" phase is not activated. See § 7.5 "Rinse during production" on page 27.

9.5. Rinse

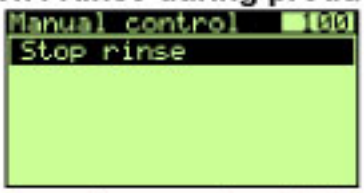
Various actions can be applied during the "Rinse" phase.
- Start production via "Start installation"
  This option is not shown if level switches are available and the storage tank is full.
- Stop rinse via "Stop rinse"
  The rinse is interrupted and the Standby phase is directly activated.

9.6. Rinse during Standby



Various actions can be applied during the "Rinse during Standby" phase.
- Start production via "Start installation"
  This option is not shown if level switches are available and the storage tank is full.
- Stop rinse via "Stop rinse"
  The rinse is interrupted and the Standby phase is directly activated.

9.7. Rinse during production

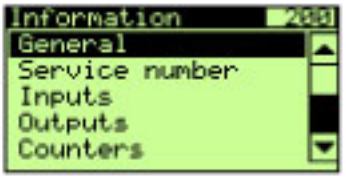


Various actions can be applied during the "Rinse during Production" phase.
- Stop rinse via "Stop rinse"
  The rinse is interrupted and the Production phase is directly activated.

10. Retrieve information

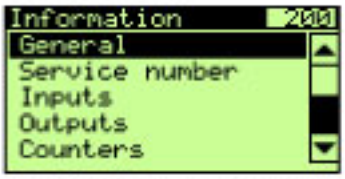
Various types of data can be retrieved from the information menu, such as: the Software version, the service telephone number, the number of service hours, the status of the inputs and outputs, the alarm history, the maintenance interval (if programmed).

The information menu is located in the main menu. The main menu can be activated via the ⊖ key, after which the bar has to be moved to "Information" (with the ▼ and ▲ keys) and the ⊖ pressed key again.



You can quit the windows with the ⊖ key.
The various information windows are discussed in the following sections.

10.1. General

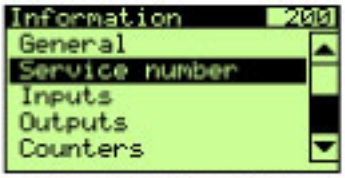


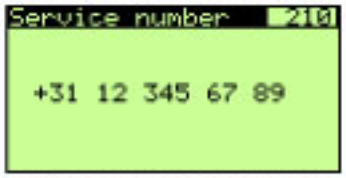
This window shows the Software version and the serial number.

The software is a combined package of various files (including language files) and the application software
- sw: software version of the complete software package
- ap: software version of the application software
- sn: serial number of the controller

The serial number is important for making a back-up on the SD card and for identification during communication (RS485, Ethernet).

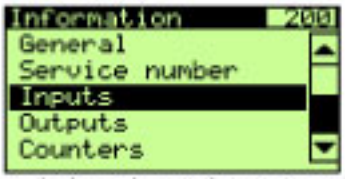
10.2. Service number





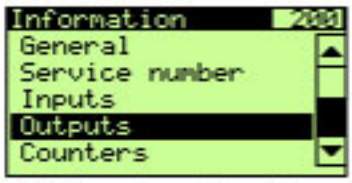
The window provides information about the service telephone number, which is programmable as described in § 20.1 "Service number" on page 65.

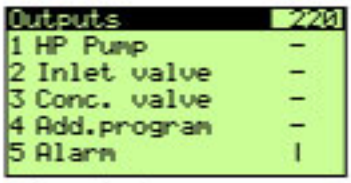
10.3. Inputs

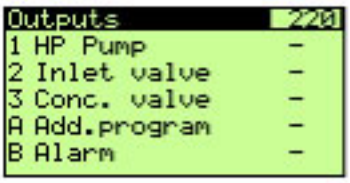


The window shows the status of the inputs.
A line is established as follows: <number> <description > <status>
<number > : indication of input on the print (1="IN 1", A="IN A")
<description > : brief description of the function
<status> : input status ("-" input is non-active, "|" input is active)

10.4. Outputs

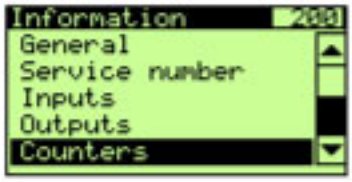






The window shows the status of the relay outputs.
A line is established as follows: <number > <description > <status>
<number > : indication of relay output on the print (1="OUT 1", A="OUT A")
<description > : brief description of the function
<status> : output status ("-" relay not activated, "|" relay activated)

10.5. Counters



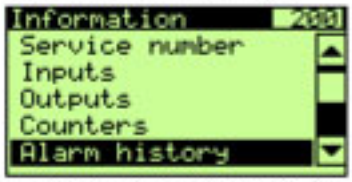
The window provides information about the number of counters.
The counters that will be shown are:

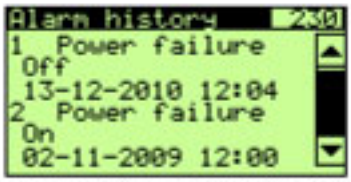
Service
This is a service hour counter showing the total number of production hours.

The number comprises hhh:mm where "hhh" stands for the number of hours and "mm" for the number of minutes. No further settings are required for this counter.

Maintenance
This counter indicates how long the unit has been in the "production" phase since the last maintenance. If the counter is not activated it will not be visible.
See also § 20.2 "Maintenance" on page 65.
The number comprises hhh:mm where "hhh" stands for the number of hours and "mm" for the number of minutes.

10.6. Alarm history



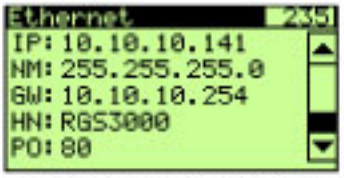


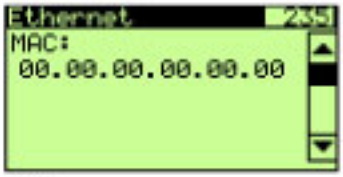
The window gives an overview of the last 20 changes in alarm situations. This means a warning will be provided about the occurrence and the removal of the alarm situation.

A warning is established as follows:

<number ><description >	: number	number of the alarm without any further meaning
	description	brief description of the alarm situation
<status>	: status	indicates whether the alarm that occurred at that time ("On") or was removed ("Off").
<date > <time >	: date	date when the change occurred
	time	time when the change occurred

10.7. Ethernet



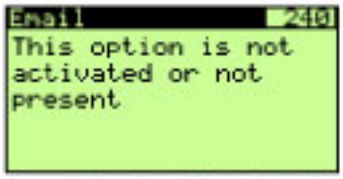


This item shows Ethernet settings that are relevant for internet and e-mail communications (see also § 13 "Ethernet" on page 41). The information is divided into 2 windows and switching between the windows possible with the ▼ and ▲ keys.
The windows show the following settings:

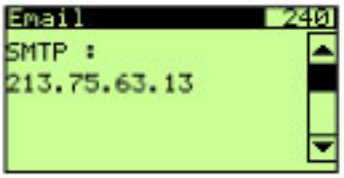
IP:	controller IP address.	HN:	Hostname
NM:	Net mask	PO:	Port number
GW:	Default gateway	MAC:	MAC address

10.8. E-mail

It is possible in the controller to send an e-mail in the event of a specific (alarm) situation or when the situation is removed. An e-mail can be sent switched on or switched off (see § 15.1.1 "Switch on / off e-mail function " on page 49).

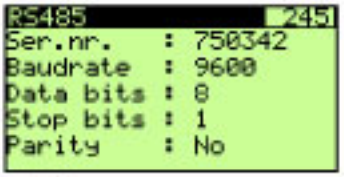


When switched off the following window is shown.



When switched on, the recipient address to which the e-mail warnings will be sent is shown. The SMTP address is also shown (via the ▼ key).
Further details about e-mail messages are featured in § 15 "E-mail" on page 49.

10.9. RS485

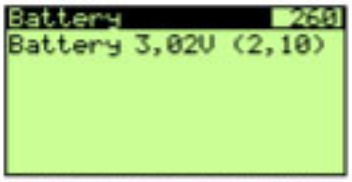


The controller routinely has a RS485 port.
Using this port, information can be sent to a PC, for example, by means of an RS232 / RS485 converter, which is not included in the delivery. The serial number is also displayed as this number is also used for identification for messages about the RS485 line.

The RS485 port-related setting cannot be programmed in this controller.

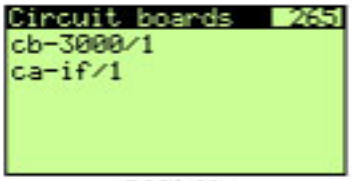
10.10. Battery power level

This window is not displayed in control units with serial numbers 750287 and 750407 – 750430.



The battery power level can be read in this window. The minimally required power level for a guaranteed operation of the clock is also indicated between brackets ((2,10) = 2.10 VDC).

10.11. Print composition in the controller



RGS3x00

RGS3x12

The controller comprises multiple PCBs (Printed circuit board).
The window shows what PCBs the controller consists of. This allows you to check if the PCBs are also actually being detected by the software.

The following PCBs may be displayed:

- cb-3000/1 : basic PCB with 3 relay outputs and 4 inputs
- cb-3000/2 : basic PCB with 5 relay outputs,d 5 inputs and RS485
- ca- eth-mmc : PCB with SD card connector and Ethernet connector
- ca-if/1 : PCB with SD card connector
- ca-if/2 : PCB with SD card connector, 2 relay outputs and 1 inout

11. Clock

11.1. General

The time and date can be set in the controller.
The time and date are used in various functions, such as data "logging".

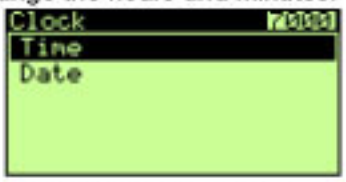
The clock setting option is located in the main menu.
The main menu can be activated with the ⊖ key. The bar then has to be moved to "Clock" (via the ⊛ and ⊛keys) and the⊖key pressed again.

You may quit the windows with the ⊖key.

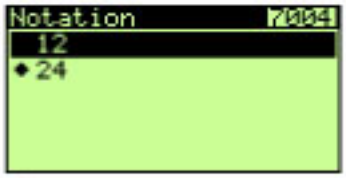
The controller has a battery so the time and date can be kept. If
the controller is switched on again the time and date have to be reset. In the case of summer time and winter time, the time and date have to be adjusted manually.

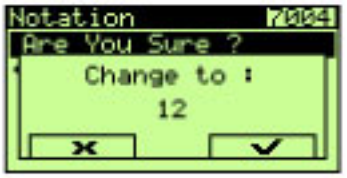
11.2. Time setting

The time setting window can be used to change the hours, minutes and time format.
The general operation for entering a value (see § 4.3.1 "Set value or text" on page 6) is used to change the hours and minutes.



The general operation for making a choice from a list (see § 4.3.3 "Set dropdown list" on page 7) is used to change the time format.
There is a choice between a "12-hours" ("03:34 AM") and a "24-hours" format ("16: 54").

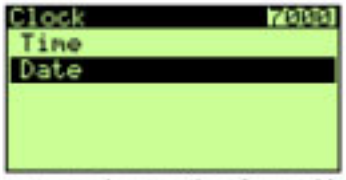




The changed time is directly up-to-date.
The time format will also apply directly. However, this is not stored when you quit the main menu.

11.3. Date setting

The date setting window can be used to change the years, months, days and the date format
The general operation for entering a value (see § 4.3.1 "Set value or text" on page 6) is used to change the years, months and days.



The general operation for making a choice from a list (see § 4.3.3 "Set dropdown list" on page 7) is used to change the date format. There are three formats to choose from.

The changed date is directly up-to-date. The data format will also apply directly. However, this is not stored when you quit the main menu.

The control unit also checks whether the date is correct (year> 2009). If this is not the case, then a message will be displayed in the alarm window that the clock must be set

Attention!
To change the current time and/or date via internet, you should use the "terminal" mode. The time and date format can be changed via the internet with both the "terminal" mode and "configurator" mode.
See § 19.6.2 "Terminal" on page 62 and § 19.6.3 "Configurator" on page 62.

12. Language setting

The controller offers you the opportunity to choose from different languages.

The language setting option is located in the main menu.
The main menu can be activated with the ⊖key. The bar then has to be moved to "Language" (with the ⊕and⊗keys) and the ⊖ key pressed again.

You may quit the windows with the ⊜key.

12.1. Change language setting

Select the required language and press on the ⊖key.

You will then be asked to confirm your choice. Press the ⊖ key to confirm the choice. Press on the ⊜ key to cancel the choice.

The texts in the menu are immediately changed in the changed language.
The language setting is not, however, stored after you quit the main menu.

Attention!
The "terminal" mode has to be used to change the language. See § 19.6.2 "Terminal" on page 62.

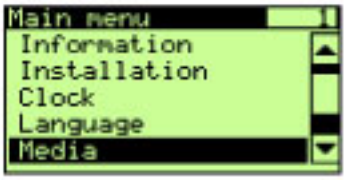
13. Ethernet

Attention ! This chapter only applies to control unit type RGS3x12.

The controller is suitable for communicating via Ethernet. The web server on the controller allows information to be exchanged with the controller via a web browser (such as Internet Explorer) (see also § 19 “Internet” on page 58).
In order to adapt the controller the Ethernet connection has to be set correctly.

This chapter will explain how the Ethernet connection can be set.

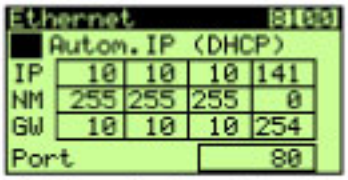
The Ethernet menu is located in the main menu. The main menu can be activated via the ⊖ key. The bar then has to be moved to “Media” (via the ▼ and ▲ keys) and the ⊖ key pressed again and next the same operations concerning the “Ethernet” option.



You may quit the windows with the ⊖ key.

13.1. Configuration

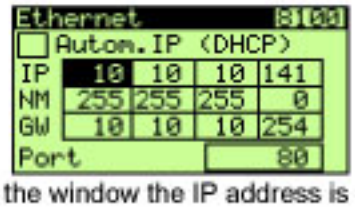
13.1.1. DHCP function



The controller has a “DHCP” function. This function is enabled when option “Autom.IP (DHCP)” has been activated.
When the controller starts up, a check is made for roughly 5 seconds to see if a DHCP server is available on the network and if an IP address is automatically assigned. If there is no DHCP server the set IP address is used (see § 13.1.2 “IP address” on page 41). In that case the “Autom.IP (DHCP)” option should be turned off.
If the IP address is automatically assigned via an DHCP server, the IP address is read off via the information menu (see § 10.7 “Ethernet” on page 37).

13.1.2. IP address

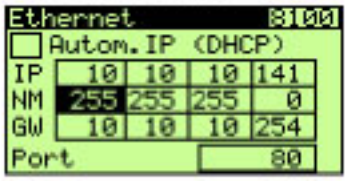
The IP address is the controller's address within the network to which the controller is connected.
The first 3 numbers are normally the same for all connected components on the network.
The final number has to be unique within the network.



In the window the IP address is entered after “IP”.

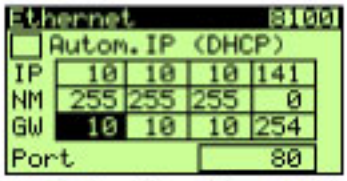
The controller also has a DHCP function (see § 13.1.1 “DHCP function” on page 41)
to check if the controller is automatically assigned an IP address from a DHCP-server (in a router, for example).
If this is the case, the IP address set here is not used. The automatically assigned number can be read off in the information menu (see § 10.7 “Ethernet” on page 37).

13.1.3. Subnetmask



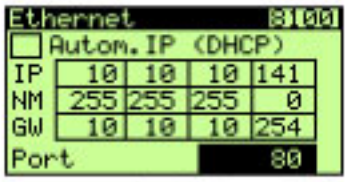
In the window the subnetmasker is entered after "NM".
This generally has to be set as 255.255.255.0, showing that the
first 3 numbers of an IPaddress, within the network, have to be the same and the final number has to be unique.

13.1.4. Default gate-way



In the window the address of the standard gateway is entered after "GW".
The address has to be set in the IP address of the appliance (router or modem, for example) connecting the network with another network (such as the internet).

13.1.5. HTTP port number



The port number 80 is routinely used for the internet (World Wide Web).
The port numbers 1 to 1023 are officially reserved but may be set, if necessary.

The port number may have to be changed if, for example, 2 controllers are placed behind a modem or router that both have to be accessible via the internet. In the router or modem another port has to be earmarked for both controllers.
A corresponding port number then has to be entered in the window.

If a port number other than port 80 is used then a colon and port number have to be entered in the browser's URL bar, after the IP address or domain name. For example: 198.162.0.10:1024 for the use of port number 1024.

Attention!
The changed port number becomes active only if the controller is switched off and switched on.

13.2. Access via internet (WAN)

Here it is indicated how the modem can be set to be granted access to the controls via the internet (WAN). It further describes how the IP address of the modem can be traced on the internet.
.
The modem is connected to two networks, namely the internet (WAN = Wide Area Network) and the local network (LAN = Local Area Network). The modem has an IP address in both networks. To gain access via the internet to the control, a so-called "NAPT entry" (Network Address Translation) must be created in the modem.
Thus the modem will know to which IP address in the local network the incoming messages are to be transmitted.
If the DHCP (DHCP = Dynamic Host Configuration Protocol) server is activated in the modem, the IP address of the controller (which is accessible via the internet) must be reserved ("DHCP lease"). The controls are then always assigned the same IP address. This is necessary because only a fixed IP address can be specified in the "NAPT entry" to control the internet access.

Below is a schematic example of a configuration. Here the "PC-1" and "modem-1", for example, are placed in the office of the supplier of the installation.

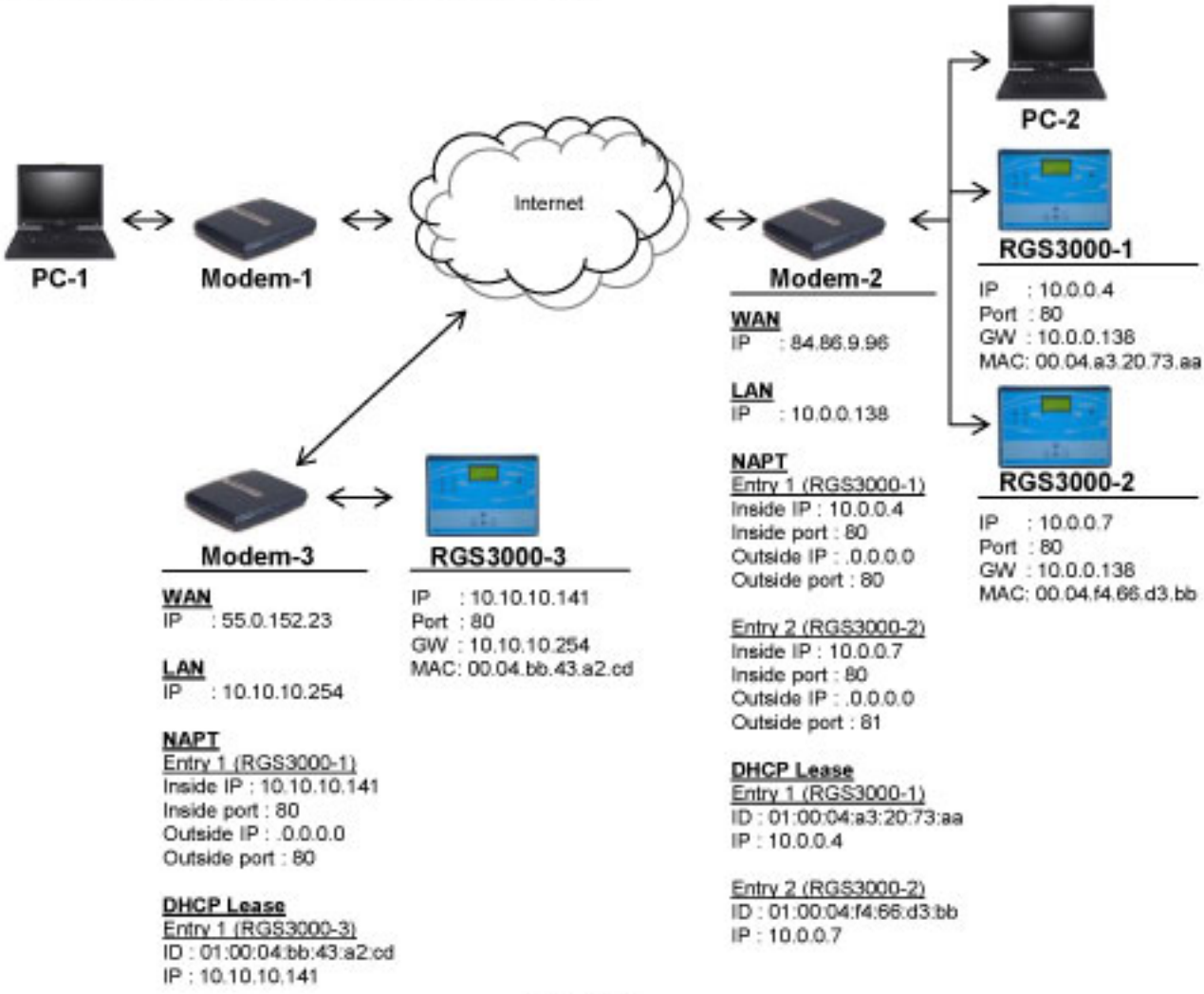
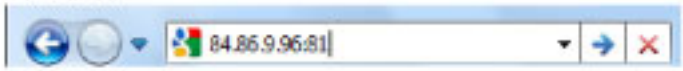


Figure 13.1

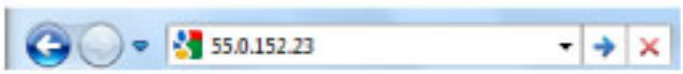
Examples:

1) If you want to connect from your PC (PC-1) with control RGS3000-1 then you must enter the following in the URL bar of the internet browser:

2) If you want to connect from your PC (PC-1) with control RGS3000-2 then you must enter the following in the URL bar of the internet browser:



3) If you want to connect from your PC (PC-1) with control RGS3000-3 then you must enter the following in the URL bar of the internet browser:



13.2.1. IP address of the modem (WAN)

The IP address of the particular modem on the internet can be obtained by inserting http://www.whatismyip.com in the URL bar of the browser on a computer that is connected to the local network "behind" the particular modem. A web page will appear with the IP address of the modem. This address must be used to access the control via the internet. If this is done on, for example, PC-2 (see Figure 13.1), then the IP address "84.86.9.96" will be displayed. This IP address is not adjustable.

13.2.2. IP address of the modem (LAN)

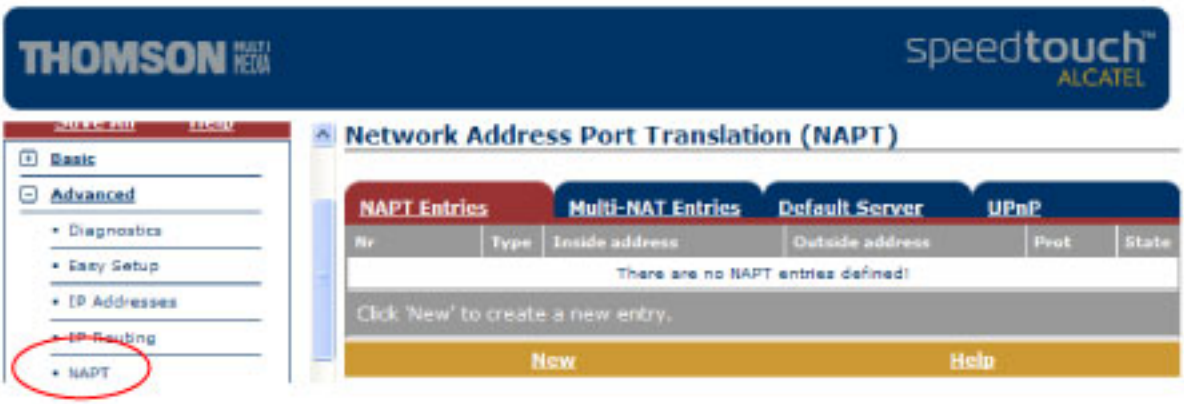
The modem is equipped with a specific IP address in the local network. This IP address can eventually be modified, but this is not really common. This IP address can be found in the instruction manual of the modem. The modem can subsequently be connected to a PC.
The IP address of the PC should be set so that it can communicate with the modem. To connect to the modem, the IP address of the modem must be entered in the URL bar of the browser (for example, Internet Explorer).

13.2.3. NAPT

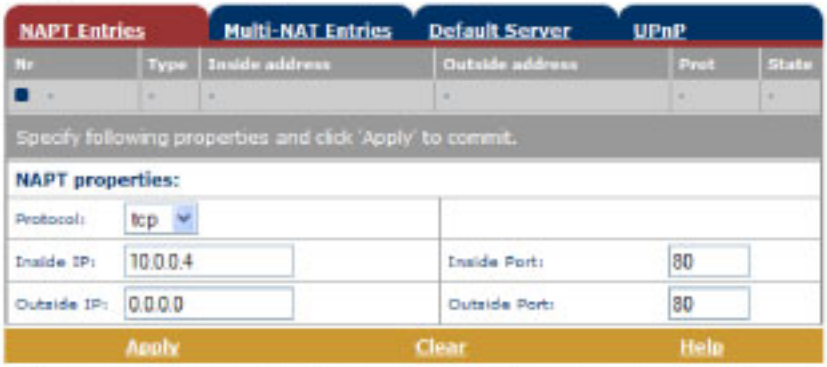
A "NAPT Entry" ("Network address port translation") is to be set in the modem. This will give access to the control of the internet. The IP and port number of the control are specified in the "NAPT entry".
See § 13.3.2 "IP address of the modem (LAN)" on page 42, how to make a connection between a PC and the modem.

If you have two controls in the local network that should be accessible via the internet, they must communicate via the internet through different ports. Standard communication is via port 80.
The modem will transmit the incoming messages (from the internet) directly to the control with a specific IP address and port number in the local network.

Example with a Speedtouch 520i modem:



Open "Advanced" in the menu and click subsequently on "NAPT". Make a "NAPT Entry" by clicking on "New".



Enter the IP address (in this example: 10.0.0.4) and port number (in this example: 80) of the control that should be accessible via the internet.

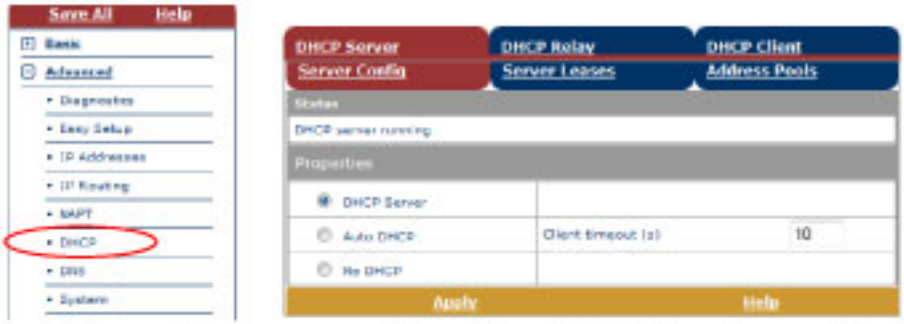
If several controls should be accessible via the internet, then one should make use of the ports. The setting "Outside Port" should be set differently for each control. This port number should then be used in the URL bar of the browser of the PC (also see the examples given in Figure 13.1).

Save the settings by clicking on "Save All".

13.2.4. DHCP Lease

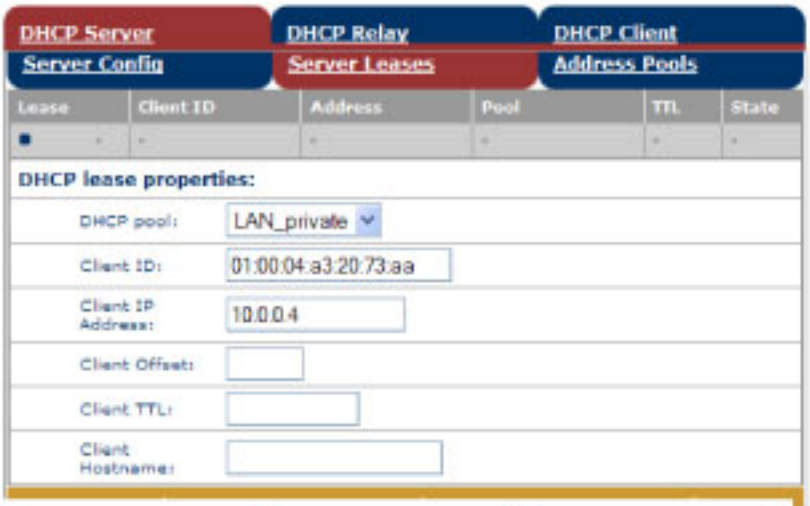
If the DHCP server in the modem is activated (see also § 13.1.1 "DHCP function" on page 41), a so-called "DHCP Lease" must be created. This establishes that the modem always assigns a fixed IP address to a particular device (in this case the control) in the local network. The IP address should be equal to the IP address (Inside IP) that is set in the "NAPT entry". See § 13.3.2 "IP address of the modem (LAN)" on page 42, how to connect a PC to the modem.

Example with a Speedtouch 520i modem:

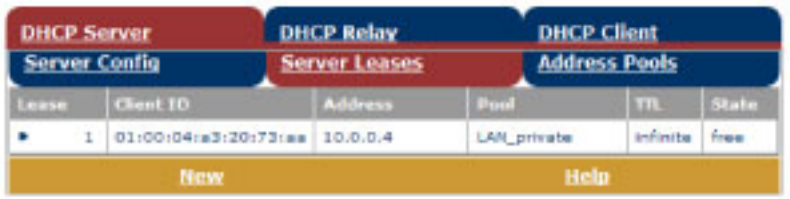


Open "Advanced" in the menu and then click on DHCP. It is subsequently indicated in the "Server Config" window whether the DHCP server is enabled. If so, then the following steps must be performed.

Click on "Server Leases" and an overview of the set "Leases" will be displayed. Click on "New" to create a new "Lease".



Enter "01" in "Client ID" then and thereafter the MAC address (see § 10.7 "Ethernet" on page 35) of the control and enter the IP address of the control in the "Client IP Address". Then on "Apply".



The adjacent represented overview will now be displayed.

Save the settings by clicking on "Save All".

14. SD card

The SD card function can be used for various purposes such as changing application software, making "OEM" software, storing alarms, measurement data and process data.

This chapter will explain how this can be set and how the cards are organised in relation to the directory structure.

For the specifications of the SD cards see § 35 "Technical specifications" on page 84.

14.1. Arrangement of the cards

A separate card has to be created for each SD card application.
The following types of cards may be distinguished:
- cards with original software
- cards with "OEM" software
- cards with software back-ups and log files

One card type may display data about different types of controllers.
For example, one card with original software may feature the original software of both type RGS3000 and type RGS5000 controllers, etc.…

The distinction is made to keep the cards of the installer (OEM) and end user separate. A SD card can also be kept in which only original software is placed.

14.2. Directories

Below is a description of where the files are stored on a SD card.
The files are invariably stored in pre-defined directories.

The directory structure is as follows:

Original software	: *X:*\ <*controller type* > \ software \ original \ *Vxxxxxx_xx*
OEM software	: *X:*\ <*controller type* > \ software \ oem \ *Vxxxxxx_xx*
Back-up software	: *X:*\ <*controller type* > \ software \ back-up \ *Vxxxxxx_xx_jjmmdd*
Alarm log files	: *X:*\ <*controller type* > \ log \ <*ssssss*> \ alarm
Data log files	: *X:*\ <*controller type* > \ log \ <*ssssss*> \ data
Process log files	: *X:*\ <*controller type* > \ log \ <*ssssss*> \ process

Explanation:

X:\	= Main directory of the SD card
Vxxxxxx_xx	= Software version number
Vxxxxxx_xx_jjmmdd	= Software version number with date of the back-up
<*controller type* >	= for example RGS3000, RGS5000, etc…
<*ssssss*>	= The controller's serial number. Each serial number consists of 6 digits

Attention!
Any departure from this directory structure could result in the software failing to identify the card so the card's data cannot be read.

14.3. Software files

The controller is routinely delivered with the latest Software version (at that time).
If further changes are subsequently made in the software the software may be adapted by copying the original software to a SD card and loading via the Boot program in the controller (see § 25 "Boot software" on page 73). Get in touch with your supplier to obtain the latest version.

Once the original software is loaded, the controller will be reset to the factory settings.
You need to reset the controller with the settings you require.

After the settings have been changed, these settings may be stored together with the software as a back-up. The back-up may be used, for example, to secure the settings of a, normally, properly functioning unit, prior to making settings or software-related changes.

To make a back-up see § 17.2 "Back-up by the end user " on page 53.
If the back-up made has to be replaced you may use the
boot program again (see § 25 "Boot software" on page 73).

14.4. Log functions

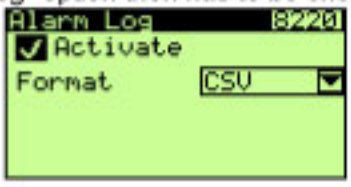
There are three types of log functions: alarm logging, data logging (status / measurements) and process information logging. As for how these can be set, first of all the SD card function has to be switched on to access the log functions. See the windows below.

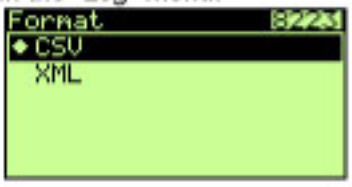
Attention!
The SD card function has to be switched off before the SD card can be removed from the controller.

This is to prevent the files from becoming unreadable.
Files in XML format are therefore correctly closed.

14.4.1. Alarm log function

If an (alarm) warning has occurred in the system, the warning may be stored in the SD card. The "Alarm Log" option then has to be chosen in the "Log" menu.





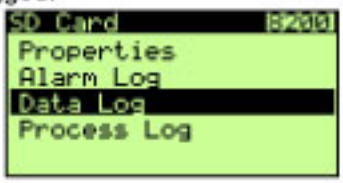
The alarm log function can be activated via this window and the "format " of the information sent can be specified. The information can be stored in CSV format and in XML format .

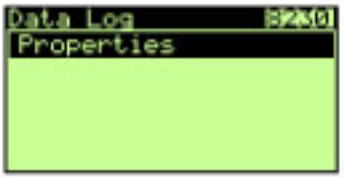
The size of the file may vary somewhat. About 100 bytes can be counted for each alarm.

For more information about the log function, see § 18.1 "Alarm " on page 54.

14.4.2. Data log function

In order to check the quality of the water at a later time, for example, the measurement value can be logged.





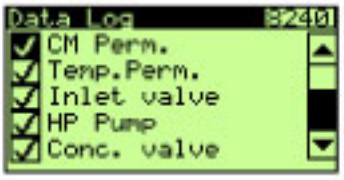
Towards this end, the data log function has to be activated (in "Properties" option).
CSV: For all data logging roughly 100 kB a day.
XML: For all data logging roughly 200 kB a day.

Properties

The "Properties" option is used to activate the data log function and to specify the "format" of the stored information. The information can be stored in CSV format and in XML format .
An interval time of between 1 and 9999 minutes may be specified for logging.

The "Header" field (appears only if the CSV format is set) can be used to indicate if an information line has to be added after a specific number of lines with status / measurement information (in the above example after 10 lines). An interval of between 1 and 999 lines may be specified. The data is separated by a comma.
For more details about the log functions and the format type see § 18.2 "Data information" on page 55.

Data
The "Data" option is for setting which data is logged.



For this the field of the corresponding function has to be "checked". The status of the measurement value of the corresponding function will then be featured in the information line.

14.4.3. Process log function

This window can be used to activate the process log function. The data is stored in ASCII format and cannot be set. The format appears as follows:

date time unit (sub) process

If the controller has been voltage free this is also indicated in the file, with the date and time the controller was switched on and off.
The size of the file may vary somewhat. Roughly 50 bytes can be counted on for each process change or power failure.
For more information about the log function see § 18.3 "Process data" on page 57.

15. E-mail

Attention ! This chapter only applies to control unit type RGS3x12.

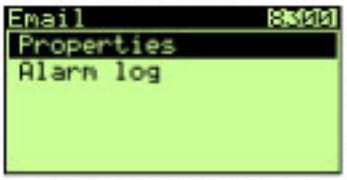
The controller can be used to send e-mails with (alarm) warning.
The options will be explained in this chapter as well as how the controller has to be set.

The e-mail menu is located in the main menu. The main menu can be activated via the ⊖ key.
The bar then has to be moved to "Media" (via the ▼ and ▲ keys) and the ⊖ key pressed again and then the same operations concerning the "Email" option.

The configuration can be set via the "Properties" option.
The situation in which an e-mail is sent can be set via the "Log" option.
You may quit the windows with the ⊖ key.

15.1. Configuration

To send e-mails a number of parameters have to be set in the controller.



In this window the following items have to be set:
- Switch on / off e-mail function
- E-mail address of the recipient
- IP address of SMTP-server

15.1.1. Switch on / off e-mail function

The e-mail function can be switched on and off in the window via the "Activate" option.

If the option is "checked" the function is switched on and the various programmable settings are accessible.

15.1.2. IP address of SMTP server

To send an e-mail the IP address of an internet provider's SMTP-server is required for the local internet connection.

Generally speaking, only the domain name of the SMTP-server is known. This can be found in your "e-mail account", for example (such as "Outlook"), the address specified in the SMTP-server.

http://www.whatsmyip.org/whois/, for example, allows you to search for the related IP address of the SMTP server by entering the domain name.

15.1.3. E-mail sender

The controller will send an e-mail with a specific sender name. In this case the sender is therefore the controller.
The controller will compose the name from the name of the controller (for example, RGS3000) and the controller's serial number. "@wxs.nl" is routinely added to this.
The name of the sender cannot be set by the user.

Example: rgs3000_752032@wxs.nl.
E-mail sent by a RGS3000 type controller with serial number 752032.

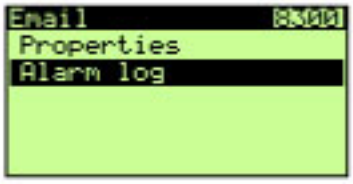
15.1.4. E-mail address of the recipient

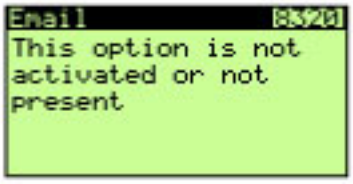
There is an option to enter the e-mail address of the recipient (where the controller has to send the-mails).

An e-mail address with up to 55 characters may be entered.

15.2. Log functions

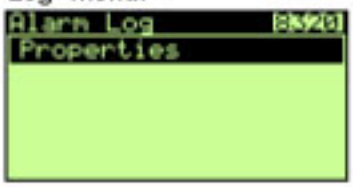
If an (alarm) warning has occurred in the system a warning can be given via e-mail. The "Log" option then has to be chosen in the "Email" menu.





15.2.1. Alarm log function

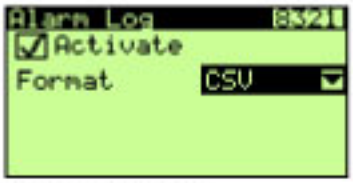
If an (alarm) warning has occurred in the system a warning can be given via e-mail. The "Alarm Log" option then has to be chosen in the "Log" menu.



If the alarm log function is activated (in "Properties") option the "Alarms" option will be automatically displayed.

Properties

The "Properties" option allows the alarm log function to be activated and the "format" of the information sent to be specified (only the CSV format is available at the present time).



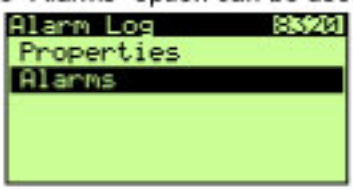
The message in the e-mail is established as follows:

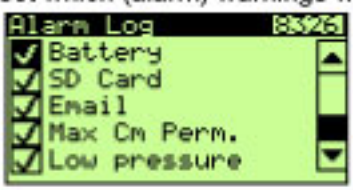
date, time, status of the warning (on/off),description of the warning, phase where the warning occurred (where relevant).

For more information about the log function see § 18.1.1 "CSV format" on page 54.

Warnings

The "Alarms" option can be used to set which (alarm) warnings will require an e-mail to be sent.





For this, the field for the corresponding warning has to be "checked".
An e-mail will then be sent at the time the situation occurs and when the situation is removed.

16. RS485

Attention ! This chapter only applies to control unit type RGS3x12.

The controller has an RS485 connection.
The RS485 connection can be used for data logging (status / measurement), alarms and process data. This chapter will explain how this can be set.

The RS485 menu is located in the main menu. The main menu can be activated via the ⊖ key.
The bar then has to be moved to "Media" (via the ▼ and ▲ keys) and the ⊖ key pressed again and then the same operations as regards the "RS485" option.
You may quit the windows with the ⊖ key.

16.1. Configuration

16.1.1. Configuration in the controller

The configuration of the RS485 connection is fixed and cannot be programmed.
The connection is configured as follows:

- Baudrate 9600 Baud
- Data bits 8
- Parity No
- Stop bits 1

16.1.2. Configuration of the "Hyperterminal"

The controller can be connected with a PC by means of an RS232 / RS485 converter, which is not included in the delivery. For example, a "Hyperterminal" can be used to consult and possibly store the data sent by the controller. "Hyperterminal" is routinely available in "Windows" under "Desktop accessories – Communications".

16.2. Log functions

There are three types of log functions: alarm logging, data logging (status / measurements) and process information logging.
Below is an explanation of how these can be set.

16.2.1. Alarm log function

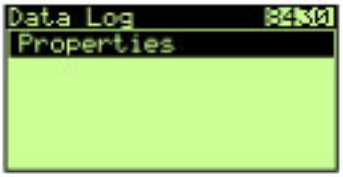
If an (alarm) warning has occurred in the system a warning may be given via the RS485 connection on a PC, by means of an RS232 / RS485 converter, which is not included in the delivery. The "Alarm Log" option then has to be chosen in the "Log" menu.

The alarm log function is activated in this window and the "format" of the information sent can be specified (only the CSV format is possible at the present time).
date, time, status of warning (on/off),description of the warning,
phase where the warning occurred (where relevant).

For more information about the log function see § 18.1.1 "CSV format" on page 54.

16.2.2. Data log function

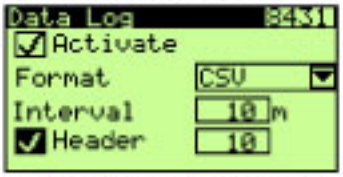
In order to check the quality of the water at a later time, for example, the measurement value can be logged.



Towards this end, the data log function has to be activated (in "Properties" option).

Properties

The "Properties" option is used to activate the data log function and specify the "format" of the information sent (only the CSV format is possible at the present time).
An interval time of between 1 and 9999 minutes may be specified for logging.

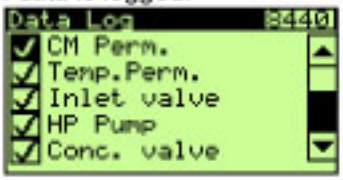


The "Header" field (appears only if the CSV format is set) can be used to indicate if an information line has to be added after a specific number of lines with status / measurement information (in the above example after 10 lines). An interval of between 1 and 999 lines may be specified. The data is separated by a comma.

For more details about the log functions and the format type see § 18.2.1 "CSV format" on page 56.

Data

The "Data" option is for setting which data is logged.



For this the field of the corresponding function has to be "checked". The status of the measurement value of the corresponding function will then be featured in the information line.

16.2.3. Process log function

This window can be used to activate the process log function. The data is sent in ASCII format and cannot be set. The format appears as follows:

date time unit (sub) process

If the controller has been voltage free this is also indicated in the file, with the date and time the controller was switched on and off.

For more information about the log function see § 18.3 "Process data" on page 57.

17. Hard disk

The controller features a memory used as a hard disk.
When software files are being installed items such as languages and web pages are written to the disk. The settings are also stored here as well as the last 20 alarms .

The hard disk data may be copied to a SD card.

There are two copying functions:
- Copying function for the fitting contractor
- Copying function for the end user

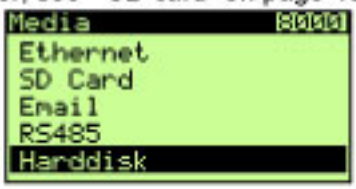
17.1. Back-up via the fitting contractor

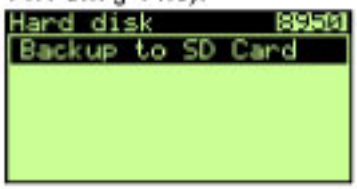
This can be done by the fitter for standard units, which nearly always have to be set the same, so the settings have to be made only once after the new software in installed. These can then be stored on a separate SD card with OEM software, see also “SD card” on page 46 (§ 14.1 t/m § 14.3), The SD card can then be used to copy the data to corresponding units.

§ 20.5 “Hard disk” on page 66 describes how “OEM back-up” can be achieved.

17.2. Back-up by the end user

The end user may also make a back-up. A SD card on which no original software or “OEM software” is stored is placed in the SD card holder, see “SD card” on page 46 (§ 14.1 t/m § 14.3).





The back-up can be made via the “Media” menu. If the window of the “Harddisk” option is opened, the back-up can be made by pressing on the ⏎ key.

18. Logging

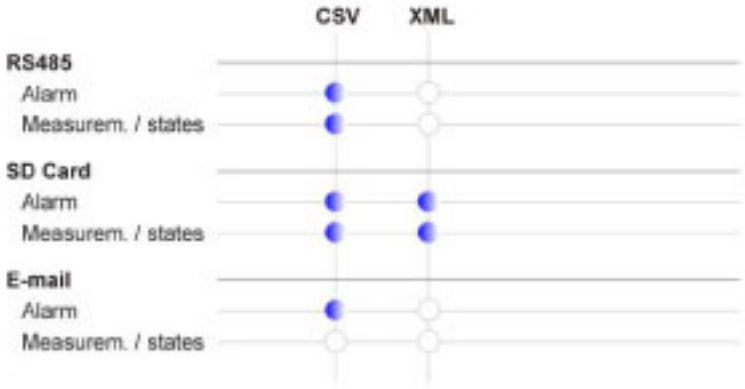
The controller allows various data to be logged
The data may be written to a file on the SD card or sent via e-mail or RS485.

The following data may be singled out:
- Alarm data
- Data information (measurement and status data)
- Process data

Depending on the medium used, alarm and data information may be generated in the following formats:

- CSV format can be imported into Excel
- XML format can be directly read off in Excel (e.g. Excel 2007).

The process data is recorded in a fixed text format.
The following table shows what data can be recorded for each medium and what recording format is available.



18.1. Alarm data

Alarms that are given can be recorded via various media (SD card, e-mail or a serial port (such as RS485). Alarms are routinely recorded.

Alarms are recorded including the date and time the alarm occurred.
The moment when the alarm situation was removed is also recorded.

18.1.1. CSV format

If the alarms are recorded in CSV format the structure will be as follows:
<Day -Month-Year>, <Hour: Minute>, <On/off >, <Warning >, <Process>

Example:

09-01-2009,13:15, On, Power failure
09-01-2009,13:30, Off, Power failure
09-01-2009,15:30, On, Exceeded pressure (RO Unit: Production)

It can be seen from the above data that controller failed on 9 January 2009 at 13:15 and switched on again at 13:30. At 15:30 there was an exceeded pressure alarm during the production process.

Example of a file name:
AL100204.CSV : This file contains alarm log data from 04-02-2010 in CSV format.

18.1.2. XML format

If the alarms are recorded in XML format the structure will be as follows:

<*standard XML* header>(= <?xml version="1.0" encoding="UTF-8"?>)
<data>
<object <*date* > <*time* > <*status*> <*warning* > <*process*> />
</data>

Example:

```
<?xml version="1.0" encoding="UTF-8"?>
<data>
 <object Date="09-10-2009" Time="13:30" Alarm="Off" Warning ="Power failure " />
 <object Date="09-10-2009" Time="13:30" Alarm="Off" Warning ="Exceeded pressure, RO Unit: Production 1 " />
</data>
```

It can be seen from the above data that controller was activated on 9 January 2009 at 13:30. In the case of an exceeded pressure alarm, for example, the warning also shows the phase (such as Production 1) when the alarm occurred.

Example of a file name:
AL100204.XML : This file contains alarm log data from 04-02-2010 in XML format.

Attention!
If XML format is used for storage on an SD card, the file can no longer be used if the alarms logger is switched off or the SD card is deactivated. See § 14.4 "Log functions" on page 47 for more information about the switching on and off of the SD card.

18.2. Data information

The data information (measurement and status data) can be recorded via various media (SD card or serial port (bv.RS485)). The type of data and the type of format (only for SD) can be set separately for each medium. The data is recorded including the date and time.

The data is indicated as follows:

- Valves, pumps, alarm and extra program
  - 0 = turned off,
  - 1 = turned on
- Switches
  - 1 = not active,
  - 2 = active but has not passed delay time
  - 3 = still active after delay time
- Tanks (supply tank and dosing tank)
  - 0 = empty
  - 2 = half full
  - 3 = full
- Measurements (level of conduction, temperature)
  - Measured value is indicated.

18.2.1. CSV format

If the data is recorded in CSV format the structure will be as follows:
<Day -Month-Year>, <Hour: Minute>, <Data 1> ….<Data n>

When the controller is started up or the record is activated a "header" is first of all produced to indicate what the corresponding data means. You can set whether the header should be repeated after a number of data lines. See § 14.4.2 "Data log function" on page 48 (SD Card) and § 16.2.2 "Data log function " on page 52 (RS485).
The header shows what component the recorded data refers to.

The header line is established as follows:
Date, Time, xx, yy, zz,……
xx, yy, zz, ….. are abbreviations of the selected logging functions.
For information about the abbreviations used see § 27 "Terminology" on page 76.
The information line is established as follows:
Date, Time, aa, bb, cc, …..
aa, bb, cc, ….. are the status or measurement data.

Example:
Header : dd-mm-yyyy,hh:mm,CMP, TM, IV, PU, …., ROU
data : 27-01-2010,08:55,1,2.3,25, 1, 1, …, Production

On 27-01-2010 at 08:55 the measured conductivity was 2.3 (µS/cm), the measured temperature 25 °C, the input valve opened, the high-pressure pump switched on and the unit was in the "Production" phase.

Example of a file name:
VL100204.CSV : This file contains data log data from 04-02-2010 in CSV format.

18.2.2. XML format

If the alarms in XML format are recorded the structure will be as follows:
<standard XML header>(= <?xml version="1.0" encoding="UTF-8"?>)
<data>
<object *<date > <time > <data1> <data2> …. <process>* />
</data>

Example:
```
<?xml version="1.0" encoding="UTF-8"?>
<data>
 <object Date="27-01-2010" Time="08:55" CMP="2.30" TM="25" IV="1" PU= "1" ROU="Production" />
</data>
```

On 27-01-2010 at 08:55 the measured conductivity was 2.30 (µS/cm), the measured temperature 25 °C, the input valve opened, the high-pressure pump switched off and the unit was in the "Production" phase.

Example of a file name:
VL100204.XML : This file contains data log data from 04-02-2010 in XML format.

Attention!
If the XML format is used for storage on an SD card, the file can no longer be used if the data logger is switched off or the SD card is deactivated.

See § 14.4 "Log functions" on page 47 for more information about the switching on and off of the SD card.

18.3. Process data

Process data can be recorded via various media (SD card or serial port (bv.RS485)). All process changes are routinely recorded.
The data is recorded in fixed text format.

The structure is as follows:

<Day -Month-Year> <Hour: Minute> <Unit:> <Process> <Status of relay outputs>

Example:

17-02-2010 13:06 RO Unit: Standby
17-02-2010 13:06 RO Unit: Production 1: IV CV
17-02-2010 13:06 RO Unit: Production 2: IV PU CV
17-02-2010 13:06 RO Unit: Production: IV PU

Any power failure is also recorded with the date and time when the controller failed and with the date and time when the controller switched on again.

Example:

==========
Power failure: 17-02-2010 12:00 - 17-02-2010 13:20
==========

Example of a file name:

PL100204.TXT : This file contains process log data from 04-02-2010.

19. Internet

Attention ! This chapter only applies to control unit type RGS3x12.

The controller is provided with a web server and is to be used with Internet Explorer.
There is a "head page", and a page with a display of the system by which the scheme is "fixed" plus a page where the controller itself is displayed.
The texts on the web pages are in English.

19.1. Access via the local network (LAN)

The controller can be connected to the LAN (locale network).
If the network uses a DHCP-server the controller is automatically assigned a correct IP address (when the controller starts up). Otherwise the controller will retain the IP address as specified in the Ethernet configuration data (see § 13.1.2 "IP address" on page 41).

If the PC seeks the controller web pages in the local network, both the controller's IP address and the controller's "local host name" can be entered in the browser's URL bar. The controller's "local host name" consists of the type of controller and the controller's serial number.

Example:

A type RGS3000 controller with the serial number 000234 has a local host name: "rgs3000_000234"

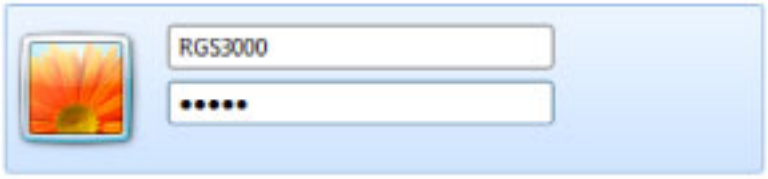
URL bar:

19.2. Access via internet (WAN)

It is possible to gain access to the control via the "world wide web" (internet).
The IP address (WAN) of the modem to which the control is connected to, with eventually the port number, must be entered in the URL bar of the internet browser. See § 13.3 "Access via internet (WAN)" on page 40 for more information about setting up the modem and the IP number of the modem.

19.3. Security

The internet pages are secured with a user name and a password. If the controller is accessed via the HTTP connection (internet) the following window will appear
If the correct information is entered, access will be allowed to the internet pages.

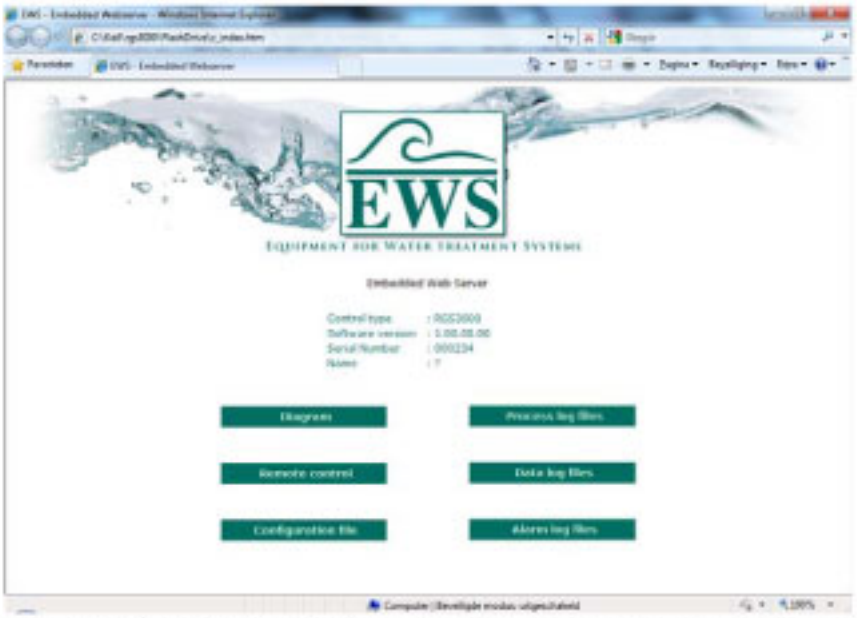


The standard settings for the user name and password are:

User name	: <type of controller >	= "RGS3000"
Password	: <empty>	= ""

There is a second security feature in the event the controllers' settings have to be changed via the internet ("terminal" mode and "configurator" mode). PC software with a USB dongle is required for this purpose (see § 19.8 "Internet key" on page 64). Get in touch with your supplier for more information about this product. The procedure for accessing both options is described in § 19.6.4 "Protection" on page 63.

19.4. Head page



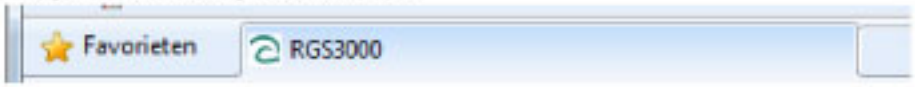
After the IP address (or "local host name") is entered and confirmed in the URL bar and the correct user name and password are entered the above page will appear in the browser.
This is the head page.

This page features information about the controller with which the connection is made.

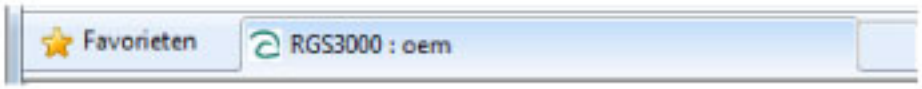
"Control type" : The type of controller.
"Software version" : The version of the software in the controller.
"Serial number" : The controller's serial number
"Name" : The controller's name
If no name is specified in the controller, a question mark will appear here.
See § 20.3 "Names" on page 66 for entering a name.

The type of controller and the controller's name will also appear in the browser's "tab".
If no name is specified in the controller nothing will be displayed.

Example: without a specified name



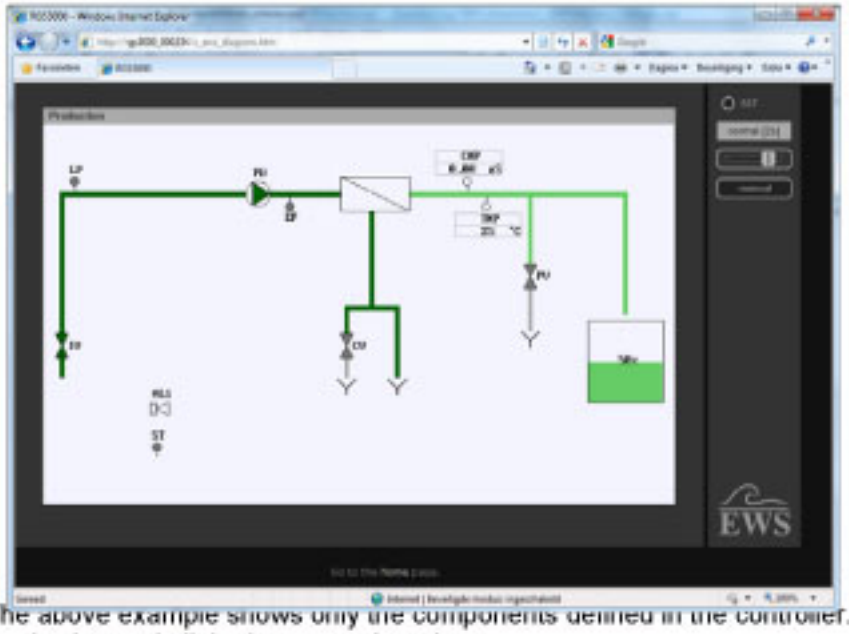
Example: with a specified name (name = oem)



Various "links" are also made to other web pages. These web pages relate to the display of the unit, the display and operation of the controller and web pages with a list of the corresponding log files (alarm, data and process).
There is also a link ("Configuration file") to a file where the controller's programming is stored in an easy-reference list.

19.5. Unit display

The current status of the unit is schematically presented on this page.
The data is refreshed every 2 seconds.



- LED communication indication
- Interval time updating front

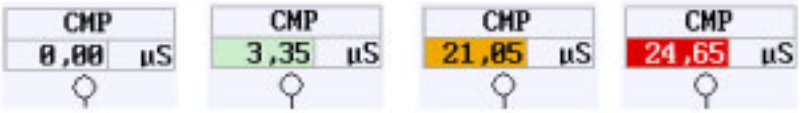
- Immediate updating front

The above example shows only the components defined in the controller. The controller is in production and all the inputs are in order.
Also shown are the measurement values or statuses of the connected components.

Piping
The pipes can have various colours.
These colours have the following meanings:

- no medium
- unrefined water
- permeate
- chemicals
- air

Measured Values



The measured values can be displayed with various background colours.
These colours have the following meanings:

- white : the measured value is not monitored.
- green : the measured value is monitored and is in order.
- orange : the measured value is too high or too low, but the delay time is not over yet.
- red : the measured value is too high or too low and the delay time is over.

Positions of the inputs:
The (digital) inputs can have the following statuses:

The input function is not supervised (grey).

The input function is supervised and inactive (green).

The input function is supervised and active, but the time delay is not finished yet (yellow).

The input function is supervised, active and the time delay is finished (red).

Positions of the outputs:
The symbols can be displayed in the following colours.

Pumps:

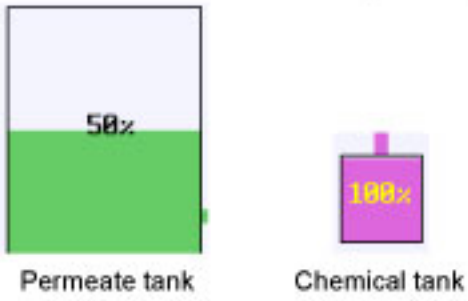
- white : The pump is turned off.
- dark green : The pump is turned on and unrefined water is being pumped.
- purple : The pump is turned on and chemicals are being pumped.

Shut-off Valves:

- dark gray : The valve is closed.
- dark green : The valve is opened and unrefined water runs through.
- light green : The valve is opened and permeated water runs through.

Attention: If the pulse function for the dosing pump output is activated a "|" will also be displayed next to the deactivated relay.

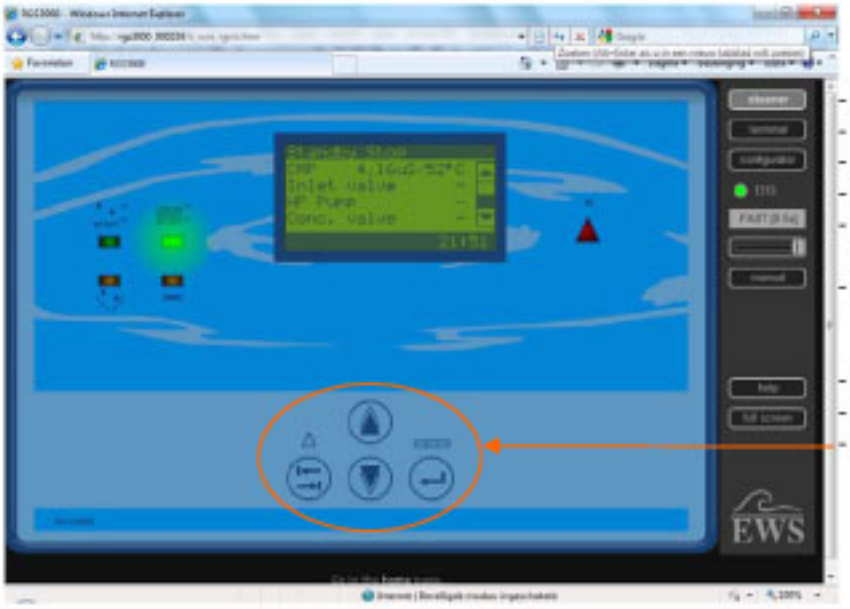
Situation of the tank
The tanks can be displayed with different background colours.
These colours have the following meanings:



Permeate tank Chemical tank

19.6. Controller display / operation

This page shows the current status of the LEDs and the current information on the LCD display. The "terminal" mode or "configurator" mode can also be used to change the settings in the controller. After the initial start-up the LEDs display and LCD display are updated every 2 seconds.



19.6.1. "Observer" mode

The "Observer" mode displays the current information in the browser, as shown on the controller. For example, a helpdesk can serve to focus together with staff onsite on examining operation-related issues.
The four keys are not activated.

19.6.2. "Terminal" mode

The four keys are activated in "terminal" mode. The mode is secured hence it is accessible only to authorised persons. § 19.6.4 "Protection" on page 63 describes the stages for gaining access. The keys can be used to operate the controller remotely. After a key is "pressed" the LEDs and LCD display will be directly updated. When no key is "pressed" the image is updated according to the interval time set.

19.6.3. "Configurator" mode

The "configurator" mode can also be used to change settings but not all the settings can be altered in this mode. The mode is secured hence it is accessible only to authorised persons. § 19.6.4 "Protection" on page 63 describes what the stages are for gaining access.

The following menus are not available:

- Manual operation
- Information
- Language
- Inventory
- Current time and date
- Service menu: Resets, Back-up and hardware test

All the settings are obtained in this mode (after pressing the key "Retrieve") and this can then be changed with a menu that is identical to the one in the controller. After the settings are changed you may quit the menu whereupon a "Transmit" key will appear under the "Retrieve" key. This key allows you to send the changed settings to the controller.

Attention!
When the settings have been received, the controller will be automatically started again.
The controller will check if a SD card is in the holder along with valid software.

19.6.4. Protection

Access to the "terminal" mode and the "configurator" mode is secured.
Access may be obtained with PC software ("Internet key", see also § 19.8 "Internet key" on page 64).

Attention!
The controller will invariably allow only one user access to one of the two options.

As soon as the "terminal" mode or "configurator" mode is activated you are first of all asked for an access code, whereupon the controller will open a "session" for the corresponding user. Access is barred to other users at this time.
The procedure has to be completed within roughly 2 minutes.

The following windows may appear:

Still no user with access.

There is already a user with access.

In the event of there still being no user with access, access may be achieved via the following procedure.

Open the WINDOWS program "Internet Key" (picture 2) on your PC. See also § 19.8 "Internet key" on page 64. The window's top bar in the browser (picture 1) features a number of characters.

It is simple to move the character strings with the Copy" and "Paste " functions in Windows.

The characters have to be entered in the "Internet key" program in the data entry field "Challenge:". Pressing on the "Make response" key in the "Response:" field will call up a character string. The string is then entered in the window's "free field" (lower bar)
in the browser.

The following windows may now appear:

Access accepted

Access denied.

If the access is accepted, both the "Terminal" mode and the Configurator" mode are used. Access is available for roughly 30 minutes. Quitting the "session" (as a result of activating the "Observer" mode, for example) will call up a window (picture 3) where the choice has to be confirmed. If the "session" is still active when the time has elapsed the window will automatically appear to show that the session has aborted (picture 4).

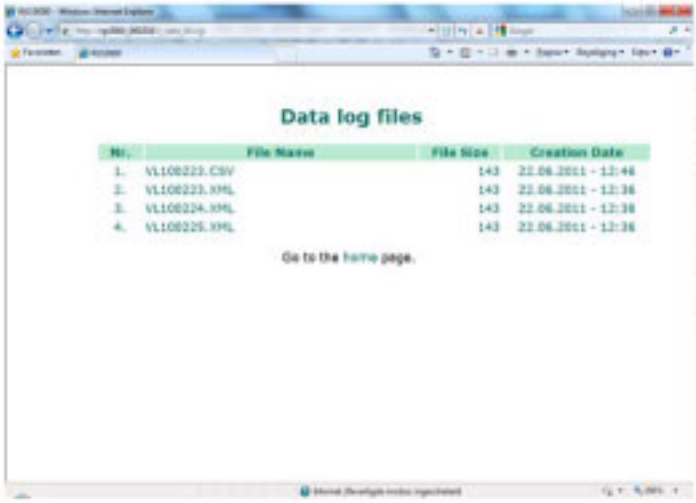
Picture 3: Quit?

Picture 4: Session time elapsed.

19.7. Getting log files

The internet can be used to view log files stored on the SD card.

In the main menu, pressing on the link with the required list of log files will call up a page with the available files. When no SD card is available no files will be displayed but a warning will be given that the SD card is not available.



Example:
The "Data log" link is pressed.

List of data log files. CSV and XML files are available on the SD
card.
Data in the CSV file logged
on 23-02-2010.
Data in the XML files
logged from 23-02-2010 to 25-02-2010.

Pressing on file name (link) will open the browser. If the file has to be downloaded the browser options have to be used.

Attention!
An XML file for the current day may be obtained only if the process for logging the corresponding data to the SD card is deactivated or if the SD card is deactivated, because during the deactivation period the XML file is converted to a valid file.
The SD card can be deactivated by staff onsite or via the "terminal" mode in the browser.
See § 14.4 "Log functions" on page 47 for more information about switching the SD card on and off.

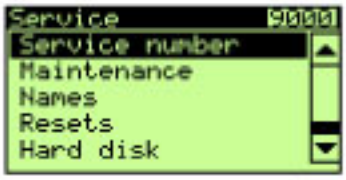
19.8. "Internet key"

To change data in the controller a security feature is available for which the "Internet Key" WINDOWS software is required. The program can be installed on a PC. The program can be opened only if the right USB dongle is connected. Get in touch with your supplier for further information.
The way to operate the program is described in § 19.6.4 "Protection" on page 63.

20. Service

The controller's service menu allows settings to be applied for maintenance and settings, which are for authorised people only.

The service settings option is located in the main menu.
the main menu can be activated via the ⊖ key. The bar then has to be moved to "Service" (via the ▲ and ▼ keys) and the ⊖ key pressed again.

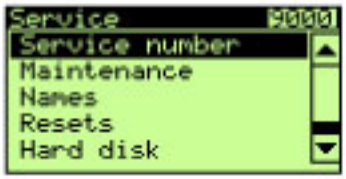


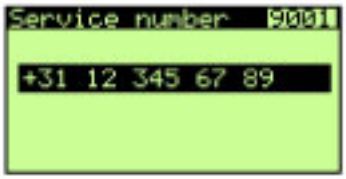
You may quit the windows with the ⊟ key.

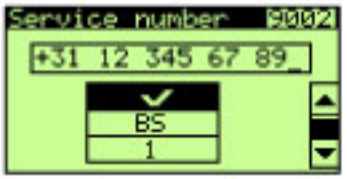
§ 4.3 "Window" on page 6 describes how a setting can be changed.

The service menu can be secured against unauthorised persons. A key then appears after "Service" to show that the option is secured (see also § 21.1.2 "Menu" on page 70).

20.1. Service number

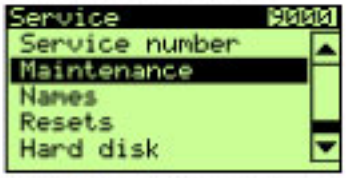


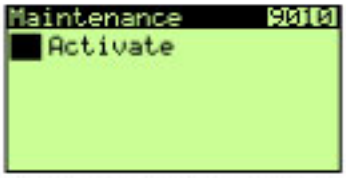




A service telephone number can be programmed in the controller. The user can ring this number in the event of any questions. The user can view the service telephone number in the information menu (see § 10.2 "Service number" on page 35).
The service number has a maximum of 19 characters.

20.2. Maintenance





A maintenance phase can be activated here, so the system (unit) programming (see § 7.6 "Maintenance" on page 28) will be displayed during the maintenance phase
During the "Standby" phase the manual operation menu will display the option to launch the "Maintenance" phase (see § 9.3 "Standby" on page 33).

If the phase "Maintenance" is activated a "Maintenance" warning may also be activated with a related interval time. This warning can be used to warn about a maintenance activity.
An interval time of between 1 and 65,000 hours may be set.

20.3. Names

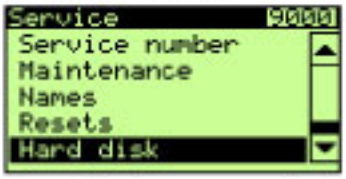
The “name” of the controller can be entered in this window. This name appears on the internet page (see § 19.4 “Head page” on page 59) to make a clear reference to a specific unit. A name with a max. of 39 characters can be specified.

20.4. Resets

Specific records may be set in this window.
- “Service” Service hour counter set at zero.
- “Maint.” Maintenance counter set at zero.
- “Alarm” Alarm history deleted.

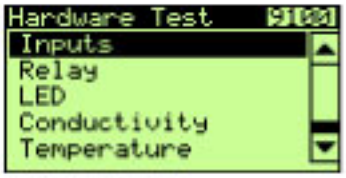
The reset is applied if the selection is moved to the corresponding key and the ⊖key is then pressed.

20.5. Hard disk



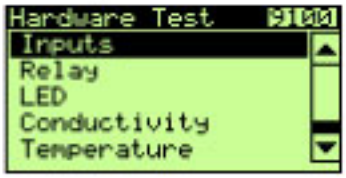
The controller's programming is stored on an internal “hard disk”. This window can be used to copy the programming to an SD card with which, for example, a standard setting for a specific unit type can be stored. The back-up can be made by pressing on the ⊖key.

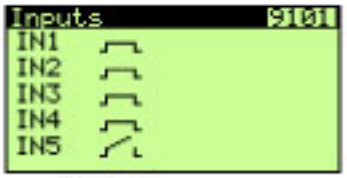
20.6. Hardware test



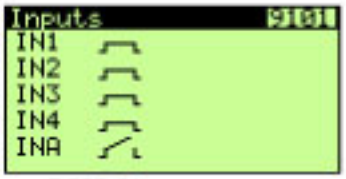
This option allows you to test the hardware in the light of the unit display and control.

20.6.1. Inputs





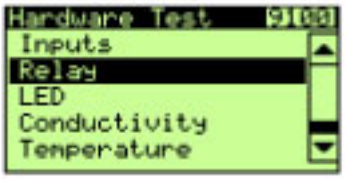
RGS3x12

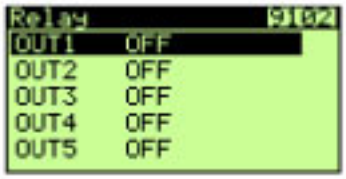


RGS3x01

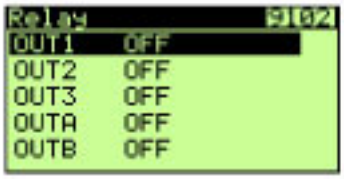
The digital inputs can be tested in this window.
- Closed input contact.
- Opened input contact.

20.6.2. Relay outputs



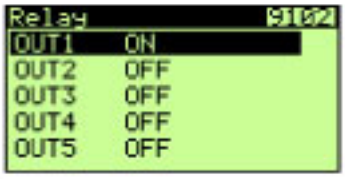


RGS3x12



RGS3x10

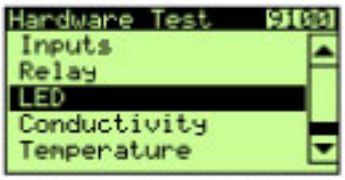
The relay outputs can be tested. The relay where the selection bar is placed can be switched on or switched off via the ⊖ key, whereupon the following windows will be called up for choice confirmation and alert.



The choice can be confirmed via the ⊖ key and cancelled via the ⊖key.

Attention!
To prevent a pump, for example, being switched on while a valve is still closed, you are advised to remove the output connections.

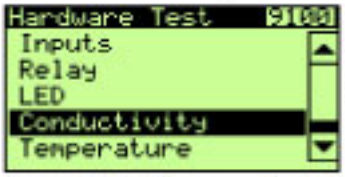
20.6.3. LEDs



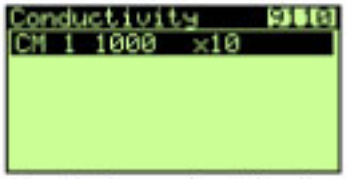
The LEDs can be tested here. The LED where the selection bar is placed can be switched on or switched off via the ⊖ key.

- LED off
- LED on

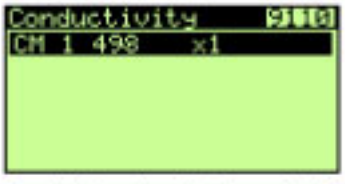
20.6.4. Conductivity meter

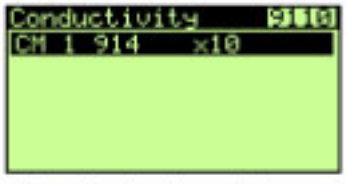


The conductivity meter's measurement range adjustment and switching can be checked as part of a two-stage process: adjusting the maximum range and checking the measurement range switching (and also checking the characteristic).



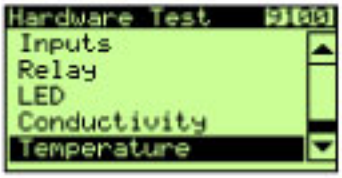
The maximum range can be adjusted by placing a short circuit on the conductivity meter input. A value of roughly 1000 then has to be specified in the window. Switching between the measurement ranges is possible via the ⊖ key. The value in the window then has to be about 1000.



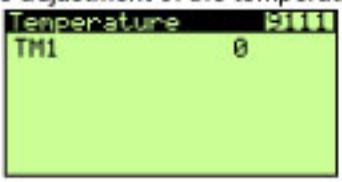


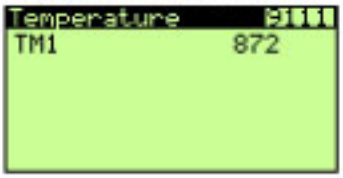
The switching (and characteristic) can be checked by placing a resistance or 1 k Ohm on the conductivity meter input. In the event of a "x1" measurement range the window has to display a value of roughly 500 and in the event of a "x10" measurement range a value of roughly 910.

20.6.5. Temperature meter



The adjustment of the temperature meter can be checked.





The characteristic's "zero point" control can be checked by placing a 1 k Ohm resistance on the temperature meter input, whereupon a value of 0 or 1 has to be displayed in the window.
The characteristics maximum control can be checked by placing a 1,33 k Ohm resistance on the temperature meter input, whereupon a value of roughly 874 has to be displayed in the window.

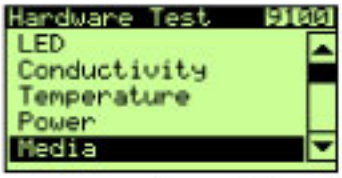
20.6.6. Battery

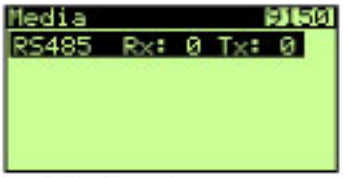
This window is not displayed in control units with serial numbers 750407 – 750430.

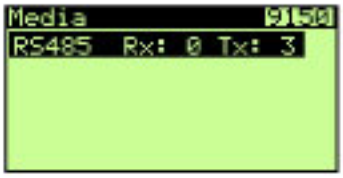
In this window, the measured power of the battery will be shown.

20.6.7. Media

Attention ! This chapter only applies to control unit type RGS3x12.







This screen can be used to control the RS485 port.
The send and receive lines can be controlled independently.

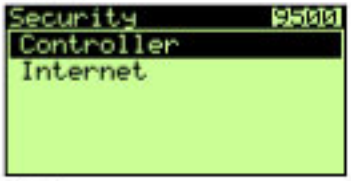
The counter behind "Rx" (receive line) is increased by 1 each time a "comtest" message is sent by the control. This message can be sent, for example, via the PC "HyperTerminal" software (settings : baudrate=9600,databits=8,stopbits=1, parity=no).
In "HyperTerminal" the text "comtest" then needs to be entered, after which the "Enter" key needs to pressed.

Pressing the ⊖ key continuously sends a message that is composed of the type of control and the serial number. For example "RGS3000 750345" for a RGS3000 with serial number 750345. If the message has been sent, the counter behind "Tx" will be increased by 1.

21. Security

The security menu in the controller is for making settings for securing certain settings and processes and securing internet access.

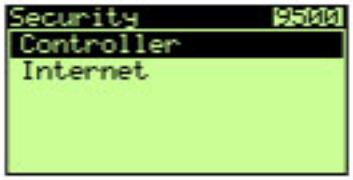
The settings security option is located in the main menu.
The main menu can be activated via the ⊖ key. The bar then has to be moved to "Security" (via the ⊛ and ⊜ keys) and the ⊖ key pressed again.

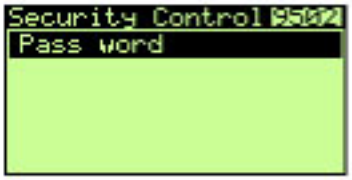


You may quit the windows with the ⊜ key.

21.1. Controller

Specific settings in the menu and processes can be secured against use by unauthorised persons. A password has to be entered towards this end.

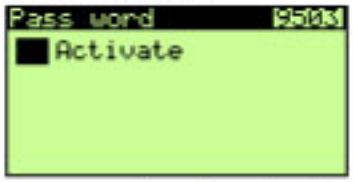


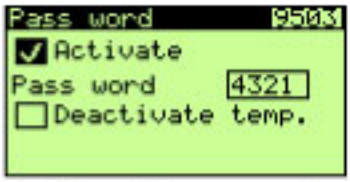


When the password is set the right password has to be entered to access this menu.

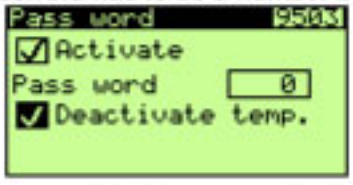
If the password is not set the menu and processes security features are not activated and nor are they shown in the menu.

21.1.1. Pass word



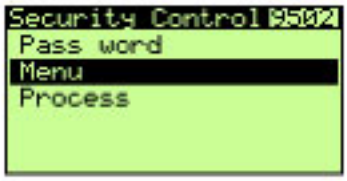


The password can be activated in this window. The password can be entered if this is activated. The password has to be a number between 0 and 9999.



The security feature may also be temporarily switched off as a result of which an authorised person can access all the settings if they remain in the menu. As soon as you quit the menu to return to the main screen the security will be automatically reactivated, thus guarding against cases where people forget to switch the security feature on again.

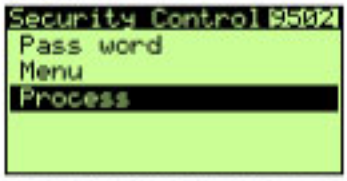
21.1.2. Menu

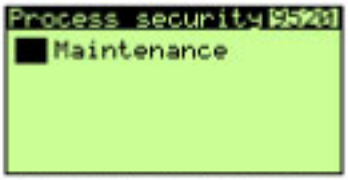


Various submenus can be secured in the menu simply by "checking the box" via the ⊖ key.

Activating a security feature for a specific component calls up a key to show the component is secured.

21.1.3. Process

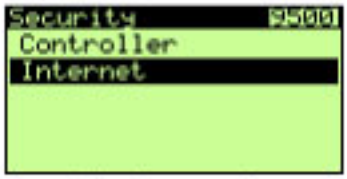




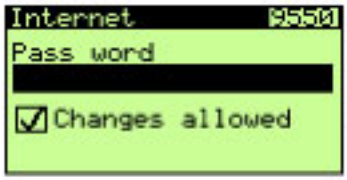
When the maintenance process is secured in the menu, no-one will be able to launch the maintenance. This security feature can be activated by "checking the box" via the ⊖ key.
The security feature first has to be turned off before the maintenance process can get underway.

21.2. Internet

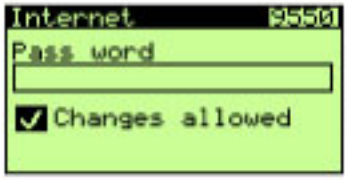
Attention ! This chapter only applies to control unit type RGS3x12.



The controller has a web server which can be connected over the internet. Various securities features are set with this option.



You will be asked for your user name and password before a connection is made to the web server (see also § 19.3 "Security" on page 58).
The password can be changed and can be a maximum of 16 characters long.



Settings can be changed via the internet.
Special PC software with a dongle is required for this.
When the "Changes allowed" option is switched off, the end user can disable any scope for changes via the internet.

22. Power failure

22.1. Clock

The data is stored in the event the controller's power supply fails.

The controller has a battery so the time and date can be kept. If the controller is switched on again the time and date have to be reset.
The control unit also checks whether the date is correct (year> 2009). If this is not the case, then a message will be displayed in the alarm window that the clock must be set. The battery may have to be replaced.
In the case of summer time and winter time, the time and date have to be adjusted manually.

22.2. Alarms

Thanks to the various alarm options, a power failure is always notified when the controller is switched on again.
Exceptions to this are the alarms via an alarm relay. With the alarm relay you can choose to have the alarm relay activated or otherwise after a power failure.
See § 6.3 “Alarm” on page 15.

22.3. Programming

The controller programming is stored in a file.
The file is read off when the controller starts.

If the programming is changed the altered data will be stored when you quit the main menu but if the controller cut outs when this is in the main menu any altered data there may be will not be stored and the “old” data will be read off again after the control starts.

23. Battery

23.1. General

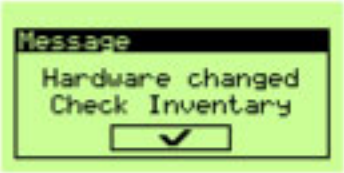
The control unit has a battery for saving date and time during a power cut.
If the battery power level is too low, there is no guarantee that date and time will be saved at a next power outage. It is recommended to replace the battery as soon as possible if the battery power level is too low.
The control unit also checks whether the date is correct (year> 2009). If this is not the case, then a message will be displayed in the alarm window that the clock must be set.

23.2. Battery type

The control units with serial numbers 750287 and 750407 - 750430 have been equipped with battery types CR1/3N and DR1/3N. The other control units have been equipped with battery type CR2032.

24. Messages

24.1. Hardware changed



If a change has been made to the hardware configuration of the control (by changing the circuit board), the above notification will appear. In this case the inventory of the components needs to be checked because it is possible that a function is no longer linked to the hardware because of removal of said hardware.

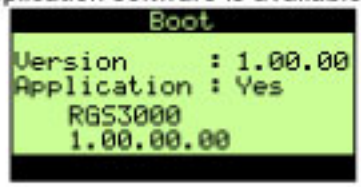
25. Boot software

25.1. General

The controller features two software programs: the boot software and the application software (for example RGS3000). If the controller is launched the boot software will first of all be opened. Explanations will be given in this chapter of the boot software and how the application software can be changed.

25.2. Changing application software

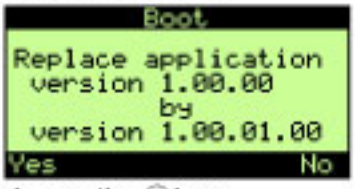
The controller will always start in the boot software whereupon the following window will appear. This shows the version of the boot software and whether a valid application is available and if so what application software is available.

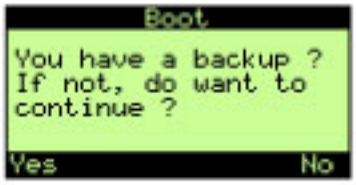


Next a check is made to see if a SD card is available in the connector intended for this purpose. If not the application software will be automatically started, provided a valid application is available.

When no valid application is available a warning appears in the display so an SD card has to be inserted with the specified software.

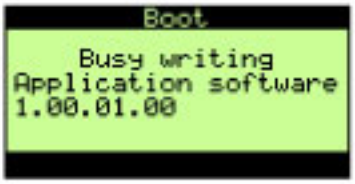
If the SD card is detected, an overview is provided of the software versions available on the SD card. The ▲ and ▼ keys can be used to select the software.





The software can be loaded by pressing on the ⊖ key.
If a valid application is already available in the controller, confirmation will be requested to make an update (press ⊜ to confirm) and you will then be asked whether a back-up has been made of the current software and settings (press ⊖ to continue).

The ⊖ key can be used to cancel the update. Any valid application available will be launched.



During the update a check is made first of all to see if the file on the SD card is valid.

The new application is next placed in the controller whereupon the internal hard disk is formatted and any other files are placed on this hard disk.

26. Frequently asked questions

26.1. General

Question:
LCD display does not show anything.

Answer:
- Is the right power supply voltage connected?
- Is there a cable cut affecting the power supply?
- Is the power supply voltage connected to the right pins (1 + 2)?
- Are the fuses OK?
- Are the tape cables correctly connected?
- Is the contrast effectively set (P4)?

26.2. Relay outputs

Question:
Relay output does not turn on.

Answer:
- Check in the main screen to see if the output is activated.
  If it is, check if the secondary fuse (F3) is OK.
  If not, check the settings for the corresponding phase.

26.3. Digital inputs

Question:
Inputs not detected.

Answer:
- Is the input activated for the corresponding phase?
  If it is, check if the secondary fuse (F3) is OK.
  If not, change the setting for the corresponding phase.

26.4. E-mail

Question:
No e-mails sent.

Possible causes:
- Only control unit type RGS3x12 is suitable for sending emails.
- Is the e-mail address provided correct? See § 15.1.4 "E-mail address of the recipient " on page 50.
- Is the IP address of the SMTP server correctly set? See § 15.1.2 "IP address of SMTP server" on page 49.
- Is the Default Gateway correctly set? See § 13.1.4 "Default gate-way" on page 42.
- RJ45 cable correctly connected (green LED for RJ 45 connector off?)
  Does the RJ45 connector's orange LED flicker when an attempt is made to send an e-mail?

26.5. Internet

Question:
Web server page does not appear in the browser.

Possible causes:
- Only control unit type RGS3x12 is accessible via internet.
- Is the correct IP address of the "local host name" entered? See § 13.1.2 "IP address" on page 41.
- In the event of a DHCP server: was the controller connected to network at start-up?
- RJ45 label correctly connected (green LED or RJ45 connector on?)
- Does the RJ45 connector's orange LED flicker when an attempt is made to send an
- e-mail?
- Is the port number correctly set? See § 13.1.5 "HTTP port number " on page 42.
- Is the Default Gateway correctly set (if contact is sought via the "World Wide Web")? See § 13.1.4 "Default gate-way" on page 42.
- Web browser possibly not compatible. Try Internet Explorer 8.

26.6. RS485

Question:
No information lines appear on the "Hyperterminal" screen.

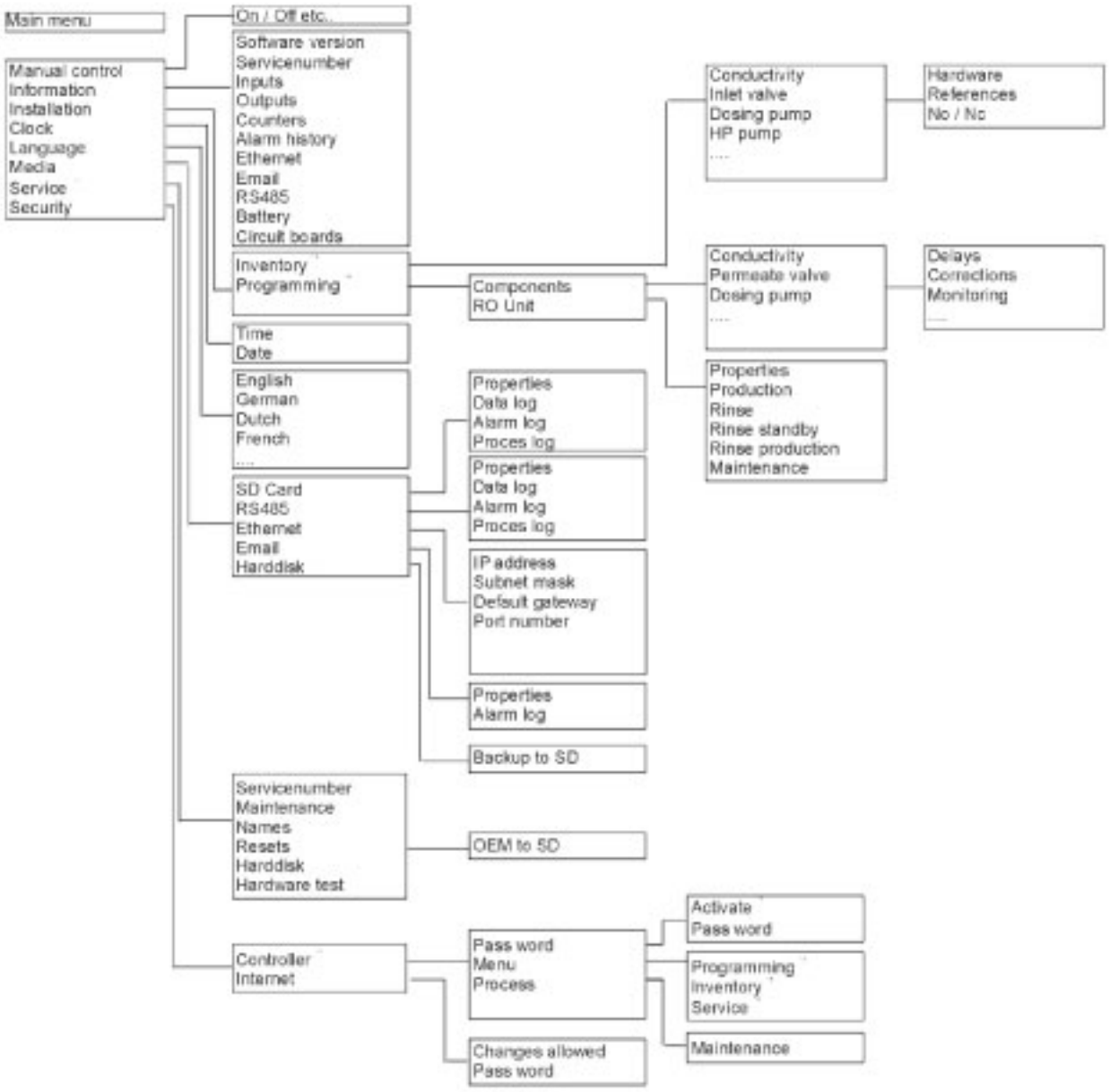
Possible causes:
- Only control unit type RGS3x12 is equipped with a RS485 port.
- Is the right COM port connected and set on the PC?
- Is a RS232/RS485 converter available?
- Is the connection on the controller correct (wires changed)?
- Are the baud rate, data bits, stop bits and parity appropriately set on the PC?

27. Terminology

This chapter provides a brief explanation about the specific terms and abbreviations used in the operating manual.

Term / abbreviation	Description
SD card	"Secure Digital" card. This is a file storage medium.
XML format	"eXtensible Markup Language". This is a general file structure for use in various types of software (such as directly opening in Excel, Access).
CSV format	"Comma Seperated Value". This is a file structure often used to record measurement data. This format can be imported into spread sheets (such as Excel)
RS485	Serial communication port which (via converter) can be connected to the PC's serial COM port by means of an RS232 / RS485 converter, which is not included in the delivery.
SMTP server	Server for an e-mail message
IV	Inlet valve
PU	High-pressure pump
CV	Concentrate valve
PV	Permeate rinse valve
PVb	Permeate block valve
PVw	Permeate 3-way valve
DO	Dosing pump
BP	Booster pump
AL	Alarm signal
ST	Stop
HL	High-level switch
LL	Low-level switch
EP	Overpressure
PBM	Pressure before membrane
PAM	Pressure after membrane
PP	Permeate pressure
LP	Low pressure
CO	Concentrate flow control switch
PS	Motor protection switch
RS	Alarm reset
RE	Regeneration input
CM	Conductivity meter
TM	Temperature meter

28. Overview menu

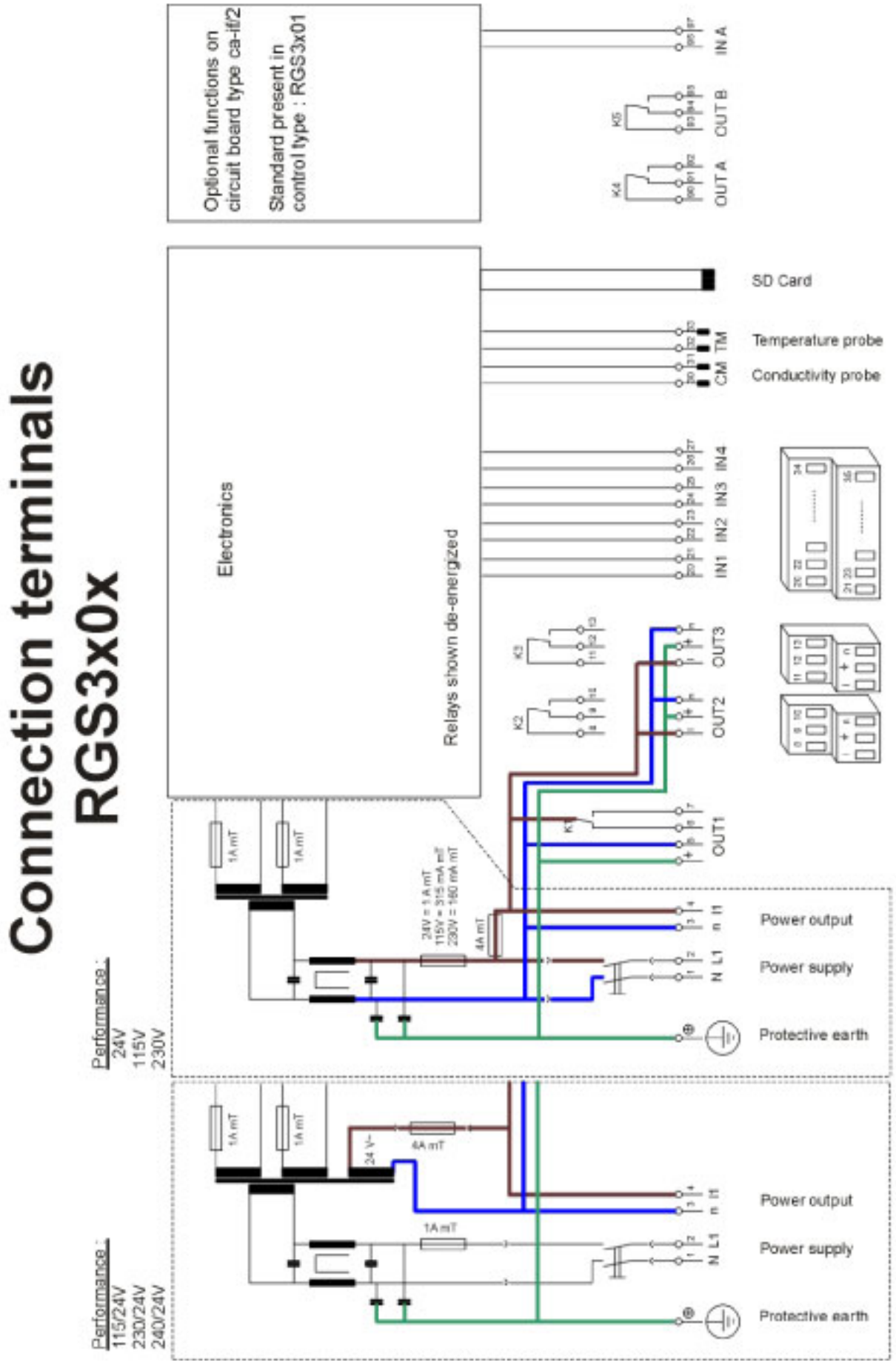


29. Opening casing

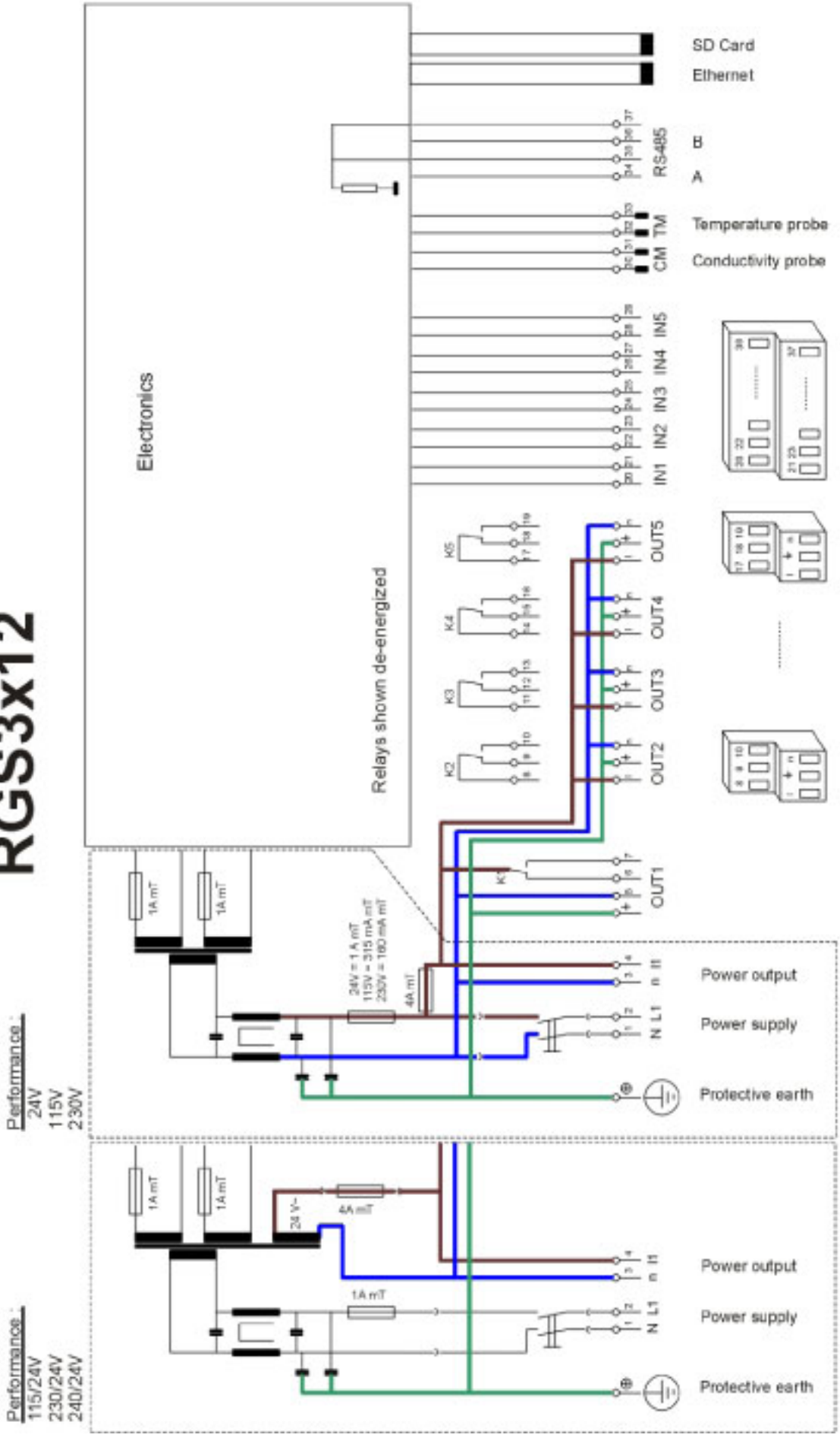
Remove the casing's two side covers.

Open the casing on the **left-hand side** by carefully placing the key cover between the hinge points and pushing until the front door springs open.

30. Terminal block connection



Connection terminals RGS3x12



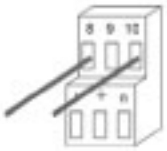
31. Electrical connection examples

Attention!
When connecting components, it is recommended to completely disconnect the power supply from the controller.

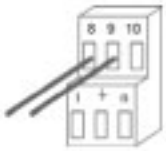
31.1. Relay outputs

The relay outputs OUT2 to OUT5 can be set both voltage free and carrying voltage. The relay output OUT2 connection examples are shown below.

Potential free:

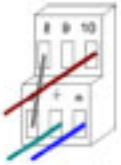


Make contact

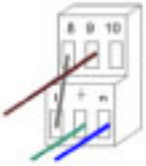


Break contact

Powered :



Normally closed (Nc)



Normally opened (No)

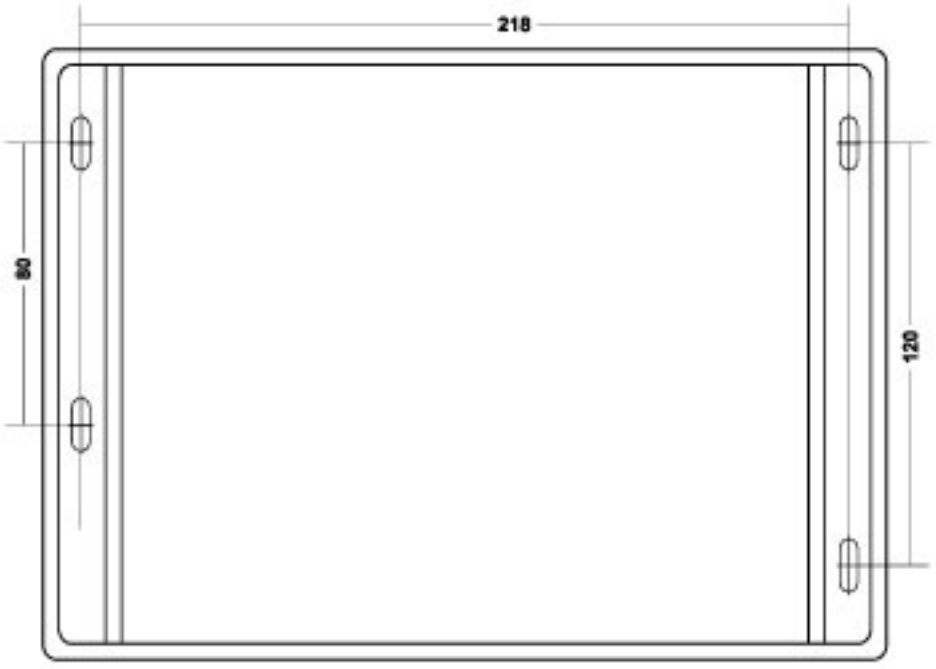
32. Installation and Start up

32.1. General

- Install the controller at eye level in a place that is convenient for the user.
- Do not install under damp wiring.
- Implement electrical connections. Take into account the instructions of the local electricity company as well as any manufacturer's specifications.
- Ensure that the connection to earth is flawless.
- Separate all wiring carrying low voltage (inputs and measurements) from supply cables (not tied together).
- Switch on the device and perform basic programming using this manual and the technical information from the supplier.
- Set the current time and date.
- Start up the unit according to the manufacturer's specifications.

ATTENTION:
Some external relays, magnetic switches, magnetic valves, etc., may produce undesired disturbance pulses when the system is switched on/off.
Therefore, it is recommended to equip these components with an RC network in advance.
Get in touch with the supplier of these components for the proper type of RC network.

32.2. Installation



32.3. Ethernet connector

The controller can be connected to an Ethernet connection. Towards this end a RJ45 connector is placed in the controller. The RJ45 plug cannot be placed through the swivel so a ready-made cable cannot be used and one has to be assembled by the user.

33. Maintenance

The controller does not require any special maintenance.

34. Spare parts

34.1. Order codes

Item code	Description	
EH-A	Panel assembly set	(4x screw, 4x insert)
EH-C-N	Side cover	
EH-C-K	Key cover	
EH-U-S	Transparent door	

34.2. Pictures

EH-A

EH-C-N

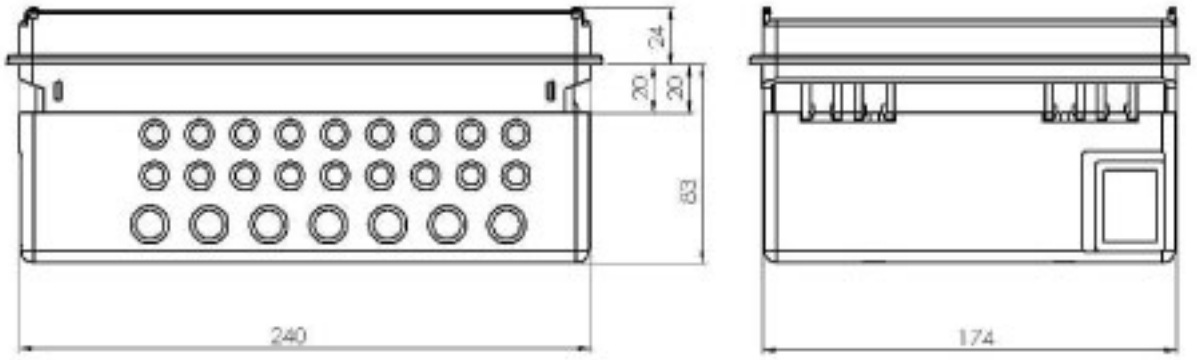
EH-C-K

EH-U-S

35. Technical specifications

Power supply	Features: Tolerance:	24VAC, 115 VAC, 230 VAC, 115/24 VAC, 230/24 VAC, 240/24 VAC 10%
Power input		12 VA
Relay outputs	Powered: Potential free:	Total 4A (all powered outputs together) 250 V, 4A per relay
Inputs		Contacts loaded 12V, 10 mA
Conductivity cell	Type: Constant:	Capacitive 0,01 – 10,00 cm^{-1}
Temperature sensor	Type: Range:	PT1000 1 - 99°C
RS485	Speed:	9600 Baud
Ethernet	Speed: Functions:	10/100 MB DHCP
Web browser		Internet Explorer 8
SD Card	Type: Capacity: Format:	Standard SD Up to 2 GB FAT12, FAT16, FAT32
CPU	Processor: Hard disk: RAM:	48 MHz 4 MB 1 MB
Protection		IP65
Ambient temperature		0 - 50 °C
Weight	IN = OUT: IN <> OUT:	ca. 2,0 kg ca. 2,9 kg
Casing	Dimensions: Built-in depth: Panel opening: Material:	240 x 174 x 107 mm 83 mm 240 x 174 mm ABS
Fuses	Relay (F4): Primary (F1): Secondary 1 (F2): Secondary 2 (F3):	4A slow 24 VAC : 1A slow 115 VAC : 315 mA slow 230 VAC : 160 mA slow 115/24 VAC, 230/24 VAC, 240/24 VAC 1A slow 1A slow 1A traag
Battery	Serialno. : 750287 and 750407-750430 Other serialnumbers	DL1/3N (Duracell) CR1/3N (Varta) CR2032
CE	Immunity: Emission: Low voltage:	EN 61000-6-1, EN 61000-6-2 EN 61000-6-3, EN 61000-6-4 2006/95/EG

35.1. Casing dimensions



Subject to technical changes without notice

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