RGS7000

Controller for reverse osmosis systems

Instruction manual

Contents

1. Description of Functions

1.1. General Information

The RGS7000 is used for automatic control and monitoring of reverse osmosis systems.

Thanks to the flexibility and programmability of its software, this controller is suitable for a large number of different applications in the field of water treatment.

Overview of functionality
- Menu-based operation and programming of controller via a graphic colour LCD display.
- "Touch panel" controller.
- Language selection. (Dutch, English, German and French.)
- Can be used with any reverse osmosis system.
- Flexible programmability for specific user needs.
- Desalinated water production via manual operation or via level switches.
- Access code option for maintenance (rinse position)
- Freely programmable service phone number.
- Option for power outputs. 0(4)-20mA (x3)
- Inputs: stop decrease, storage tank full/empty, exceeded pressure, low water pressure, concentrate monitoring, external alarm reset and motor security
- Measurements: 1 conductivity meter and 1 temperature meter
    Optional:
    -1 conductivity meter and 1 temperature meter
    - 3 flow meters (0-20mA input)
    - 3 pressure meters (0-20mA input)
- Integrated conductivity meter with automatic measurement range shift
- Conductivity measurement range according to measuring cell used (0.5 – 100,000 µS/cm).
- Cell constant of measuring cell programmable from 0.01 – 10.00 cm^{-1}
- Manual or automatic (optional) temperature compensation
- Outputs: High pressure pump, inlet shut-off valve, rinse valve for concentrate and permeate, alarm contact or booster pump, 2nd alarm contact
- Alarm history: last 15 alarm events are stored with date and time.
- Multi Media Card software update.
- Program data protection during power failures, the program data is stored without battery.
- Manufactured in accordance with EMC directives.
- Housing is suitable for wall mounting, installation and *panel* installation.
- Available in 24/24V, 115/115V, 230/230V, 115/24V, 230/24V, 240/24V

1.2. List of Abbreviations used
The following is a list of frequently used abbreviations

IV	Inlet Valve	CV	Concentrate Valve
BP	Booster Pump	PV	Permeate Valve
PU	High Pressure Pump	DO	Dosing Pump

Osmosis phases

The controller distinguishes between different phases:
- Production   Production of desalinated water
- Standby   The system is at rest so there is no production of desalinated water
- Rinse after production   Rinsing of the membrane after production
- Rinse during standby   Rinsing of the membrane during standby
- Rinse during production   Rinsing of the membrane during production
- Maintenance   System maintenance

1.3. "Production" Phase

Production of desalinated water can begin depending on the level switch(es) (LH and LL) or via manual operation.

Prior to the actual production, a set of three steps can be programmed, for instance so the inlet shut-off valve can be opened first before the high pressure pump is activated.


```
22-04-2003          Production              14:46

Phase 1      :    0s   IV BP PU CV PV DO
Phase 2      :    9s   IV BP PU CV PV DO
Phase 3      :    3s   IV BP PU CV PV DO
Production   :         IV BP PU CV PV DO

Intervall    :    0:08
```

During production, the following inputs are checked (if connected and monitoring is activated, see 10.2 "Inventory of connected components " on page 40 and e.g. § 9.1.1 "Permeate conductivity measurement" on page 19 : "Monitoring of minimum conductivity"):
- Conductivity meters
- Temperature sensors
- Relative conductivity
- All digital inputs
  Caution: Low pre-pressure and concentrate monitoring only if high pressure pump or booster pump is activated
- Flow meters (if programmed in the program step: processes \ … \ flow control)
        (See § 9.10.1 ""Production" phase" on page 35: flow control)
- Pressure meters (minimum limit value only if the high pressure pump or booster pump is activated)

During production, a service hour count will be maintained which can be read off under the *"Information"* menu option (see § 6.8 "Service hours" on page 15).

A counter will also be maintained for maintenance (if the interval time is programmed). The time remaining before the next maintenance session is displayed in the same window as the service hours. For more information, see § 6.9 "Maintenance interval" on page 15 and § 9.10.5 ""Maintenance" phase"" on page 38.

During the "Production" phase, it is possible to switch off the system manually via the Stop key. The system will go to the "Rinse after production" phase (if programmed) or to the "Standby" phase.

The system will switch off even if the level switches still indicate that desalinated water needs to be produced. The window will then indicate that the system was switched off manually.

If the "Rinse during production" phase has been activated, then the rinse can also be manually initiated by the pressing the Rinse key.

1.4. "Standby" Phase

In this step, no water is flowing and all outputs are switched off.
During this step, only the following inputs are checked (if connected):
- Level switches(s)
- Alarm reset input

```
22-04-2003              Standby                  14:49

Standby      :     IV BP PU CV PV DO
Intervall    :     0:02


```

During the "Standby phase, it is possible to switch the system on manually if no level switches are programmed or if the "tank full" switch indicates that the storage tank is not completely full.
To do this, press the `Prod.` key.

If the "Rinse after standby" phase has been activated, then the time remaining until the next rinse is displayed in the window. This rinse can also be initiated manually by pressing the `Rinse` key.

A maintenance session can also be initiated from this phase by pressing the `Maint.` key.

```
22-04-2003              Standby                  14:52

Standby      :     IV BP PU CV PV DO
Intervall    :     0:05


Manual stop of production
```

If the system has been manually stopped despite the fact that the level switches still indicate that desalinated water needs to be produced, then the window will display the message that the system has been switched off manually. The system will not switch on automatically but rather must be started up manually with the `Prod.` key.
In this situation, a rinse interval will take place, if programmed
(see § 9.10.4 ""Rinse during standby" phase" on page 37).

1.5. "Rinse after production" Phase

After production, you can program (programming\processes\rinse after production\properties) if a membrane rinse will occur after the production of desalinated water has stopped. You can program a maximum of three steps for this.

```
22-04-2003        Rinse after production         14:54

Phase 1      :   4s  IV BP PU CV PV DO
Phase 2      :  10s  IV BP PU CV PV DO
Phase 3      :   3s  IV BP PU CV PV DO
```

During the rinse, the following inputs are checked (if connected and monitoring is activated, see § 10.2 "Inventory of connected components " on page 40 and e.g. § 9.1.1 "Permeate conductivity measurement" on page 19 : "Monitoring of minimum conductivity"):
- All digital inputs
     Caution: Low pre-pressure and concentrate monitoring only if high pressure pump or booster pump is activated
- Flow meters (if programmed in the program step: processes \ … \ flow control)
          (See § 9.10.1 ""Production" phase" on page 35: flow control)
- Pressure meters (minimum limit value only if the high pressure pump or booster pump is activated)

If the system has been manually stopped despite the fact that the level switches still indicate that desalinated water needs to be produced, then the window will display the message that the system has been switched off manually. The system will not switch on automatically, rather, this must be done manually with the ⬛ Prod. ⬛ key.

In this situation, a rinse interval will take place, if programmed
(see § 9.10.2 ""Rinse after production" phase"on page 36).

Once this rinse phase has completed, the system will automatically go to the "Standby" phase. The rinse can also be manually interrupted with the ⬛ Stop ⬛ key, in which case the system will go into the "Standby" phase.

1.6. "Rinse during Standby" phase

If the system is at rest, then you can select (programming\processes\rinse during standby\properties) whether a membrane rinse will occur in intervals during the "Standby" phase. You can program a maximum of three steps for this.

During the rinse, the following inputs are checked (if connected and monitoring is activated, see § 10.2 "Inventory of connected components " on page 40 and e.g. § 9.1.1 "Permeate conductivity measurement" on page 19 : "Monitoring of minimum conductivity"):
-    All digital inputs
     Caution: Low pre-pressure and concentrate monitoring only if high pressure pump or booster pump is activated
-    Flow meters (if programmed in the program step: processes \ … \ flow control)
          (See § 9.10.1 ""Production" phase" on page 35: flow control)
-    Pressure meters (minimum limit value only if the high pressure pump or booster pump is activated)

If the system has been manually stopped despite the fact that the level switches still indicate that desalinated water needs to be produced, then the window will display the message that the system has been switched off manually. The system will not switch on automatically, rather, this must be done manually with the ⬛ Prod. ⬛ key.

In this situation, a rinse interval will take place, if programmed.

Once this rinse phase has completed, the system will automatically go to the "Standby" phase. The rinse can also be manually interrupted with the ⬛ Stop ⬛ key, in which case the system will go into the "Standby" phase.

1.7. "Rinse during production" phase

If the system is in production, then you can select (programming\processes\rinse during production\properties) whether a membrane rinse will occur in intervals during production of desalinated water.

You can program a maximum of three steps for this.

During the rinse, the following inputs are checked (if connected and monitoring is activated, see § 10.2 "Inventory of connected components" on page 40 and e.g. § 9.1.1 "Permeate conductivity measurement" on page 19 : "Monitoring of minimum conductivity"):
- All digital inputs
  Caution: Low pre-pressure and concentrate monitoring only if high pressure pump or booster pump is activated
- Flow meters (if programmed in the program step: processes \ … \ flow control)
  (See § 9.10.1 ""Production" phase" on page 35: flow control)
- Pressure meters (minimum limit value only if the high pressure pump or booster pump is activated)

Once this rinse phase has completed, the system will automatically go to the "Production" phase. The rinse can also be manually interrupted with the Stop key, in which case the system will go into the "Production" phase.

1.8. "Maintenance" phase

This phase can only be accessed via the "Standby" phase and is intended for maintenance work by a maintenance technician.

Maintenance is not automatically started immediately, rather, the installation is first in a "rest" position.

"Rest" position during maintenance

To start up the actual maintenance phase, press the Start key.

Maintenance has been activated

Maintenance must always be interrupted manually with the Stop key.

In the "Maintenance" phase, you can program a maximum of three steps, the 2nd of which is always entered in minutes.

During maintenance, the following inputs are checked (if connected and monitoring is activated, see § 10.2 "Inventory of connected components" on page 40 and e.g. § 9.1.1 "Permeate conductivity measurement" on page 19 : "Monitoring of minimum conductivity"):
- Exceeded pressure input
- Low pre-pressure input
- Motor security input

The phase must be protected by means of a security code (See § 10.1 "Security codes" on page 39).

1.9. "Standby Stop" Phase

This step will only appear if the controller is programmed for no automatic start after a power failure. The installation has to started manually by pressing the button Start .
(See § 9.9.1 "Power failure" on page 34)
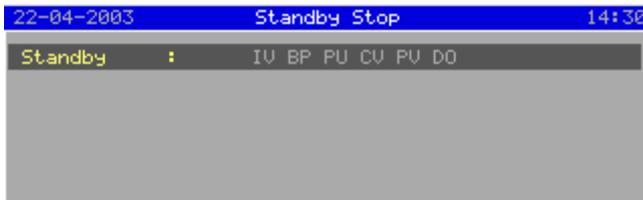
1.10. Conductivity measurement

The controller comes standard with a conductivity meter which measures the conductivity of the permeate.

With the help of an optional expansion PCB (ca-1cm-1tm) (See § 19 ". Installation of optional PCBs" on page 56), the system can be expanded with a 2nd conductivity meter for the conductivity of the incoming water or a re-switched stage. If the 2nd conductivity meter is used to measure the conductivity of the incoming water, then the relative conductivity of the permeate can also be calculated and displayed as a parameter for the degree of desalination.

The conductivity meters are equipped with two measurement ranges with automatic shifting. The measurement ranges are dependent upon the measuring cells used and have a range from very pure water of less than 1 µS/cm to saline water of up to 100 mS/cm.

You can also program a lower limit value for the functional control of the conductivity measurement and an upper limit value for quality assurance of the water. You can program the delay time for any alarms. There is also a setting for whether the system should switch off automatically in these cases (see § 9.1.1 "Permeate conductivity measurement" on page 19).

1.11. Temperature

The controller comes standard with a temperature meter which measures the temperature of the permeate. The conductivity measurement is automatically compensated for the measured temperature.

If a temperature sensor is connected to the input, then it will automatically switch over to the temperature that was set manually.

With the help of an optional expansion PCB (ca-1cm-1tm) (See § 19 ". Installation of optional PCBs" on page 56), the system can be expanded with a 2nd temperature meter for the temperature compensation of the 2nd conductivity meter.

For further information see § 9.2 "Temperature measurement" on page 22

1.12. Flow measurement

The controller can be expanded with three flow meter inputs (0-20mA) (See § 19 ". Installation of optional PCBs" on page 56).
The three inputs are for the measurement of the incoming water, the concentrate and the permeate.

You can program in a minimum and maximum limit value with programmable delay time to monitor a flow meter.
Monitoring must also be activated for each phase (see § 9.10.1 ""Production" phase" on page 35).
There is also a setting for whether the system should switch off automatically if there is a malfunction. In this case, the system can only be switched back on manually.

For a more detailed explanation, see § 9.3 "Flow measurement" on page 23.

1.13. Pressure measurement

The controller can be expanded with three flow meter inputs (0-20mA) (See § 19 ". Installation of optional PCBs" on page 56).
The three inputs are for the measurement of the incoming water, the concentrate and the permeate.

Monitoring of the pressure will only be activated if the high pressure pump or booster pump is activated (and if programmed).
There is also a programmable delay and a setting for whether the system should switch off if the pressure is too high or too low. If the system has been switched off due to an underpressure, then the system can be set to reactivate once sufficient pressure is restored.

For a more detailed explanation, see § 9.4 "Pressure measurement" on page 25.

1.14. Alarm outputs
The controller features two alarm output functions (AL1 and AL2).

The AL1 function is only available if relay K6 has not been programmed for the booster pump function. If the AL1 function has been activated, then the relay will be in the "no alarm" status when not energized.

The AL2 function is always available. The relay is in "alarm status" when not energized.
The particular malfunctions for which the AL1 and AL2 relays will activate must be programmed for the corresponding measurement function, switch or other situation, such as power failure.

For more information on alarms, please refer to § 3.4 "Alarm message display" on page 10 and § 11 " Possible error messages" on page 45.

2. Picture of front side

Wall mounting, installation and panel installation.
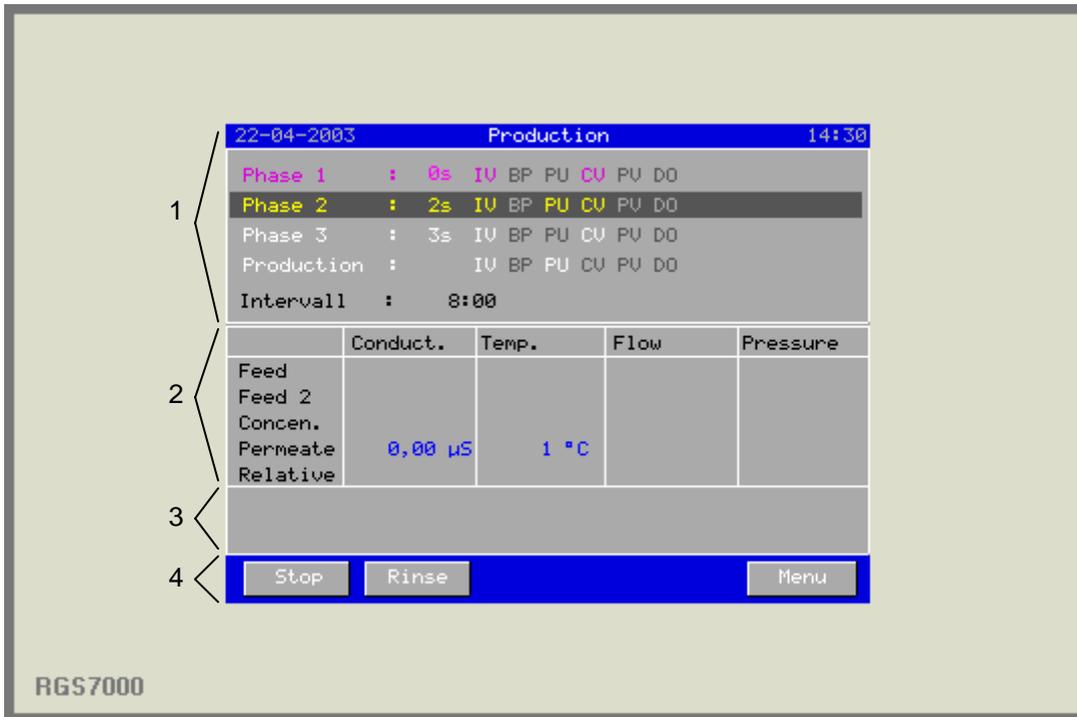
1 Window with information on the process steps
2 Window with measurement values
3 Window with alarm messages
4 Bar with buttons for manual operation and menu access
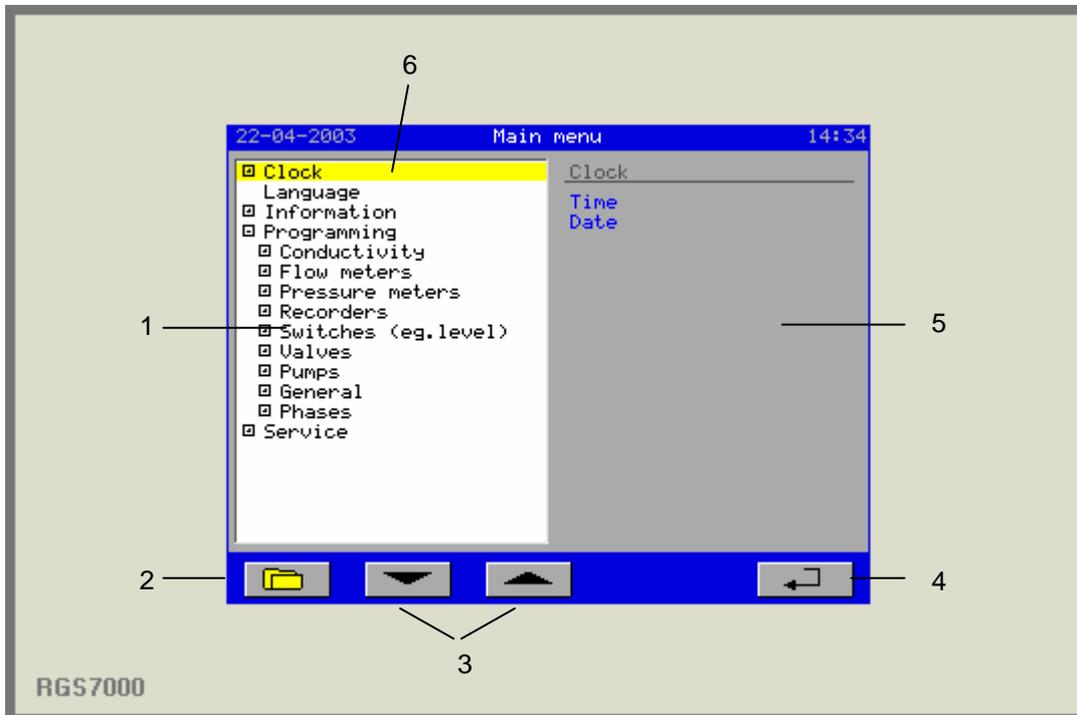
1 Window with folder structure
2 Button for opening and closing a folder
3 Navigation buttons to go through the folders
4 Button for exiting the menu
5 Window with subfolders or settings
6 Cursor

3. Measurement and function display

3.1. Process phase display

This window displays the current status of the system, such as: Production, Rinse during production, Standby, Rinse during standby, Rinse after production, Maintenance or Alarm status.

The bar indicates which step in a particular process the system is in.
This bar displays the remaining time for the sub process as well as the activated output functions (yellow) and the non-activated output functions (grey).
The output functions are abbreviated as follows:

IV = Inlet valve   CV = Concentrate valve
BP = Booster pump   PV = Permeate valve
PU = High pressure pump   DO = Dosing pump

If a sub process has completed then the remaining time will be set to 0 and the output functions that had been activated during the sub process will turn purple.
If the sub process has not yet completed, then the output functions activated during that process will be white.

If a rinse time interval was activated, then this will appear at the bottom of the window. The remaining time to the next rinse will then be displayed.

If production was switched off manually, then this will be indicated in the display. During "Standby", (if programmed) the rinse interval will be activated.

3.2. Alarm phase display

If the system should be switched off in the event of a particular malfunction, then the controller will switch to the "Alarm" phase. The window will indicate the phase in which the malfunction occurred and the cause of the alarm.
Depending on the malfunction and the programming, the system will have to be switched on manually via the ⬚ Start ⬚ key or will switch back on automatically once the cause of the malfunction is removed. The programming of the relevant input or measurement value indicates whether the system must be switched off and, if necessary, switched on automatically.
(see § 9.1.1 "Permeate conductivity measurement" on page 19).

3.3. Measurement value display

	Conduct.	Temp.	Flow	Pressure
Feed	4,50 µS	33 °C		
Feed 2				
Concen.				
Permeate	4,66 µS	33 °C		
Relative	Overflow			

The window displays all measurement values (if the corresponding hardware has been connected and the display has been activated).
The relative conductivity is indicated under "Concentrate".
It is only possible to set a different unit of measurement for conductivity, namely ppm.

3.4. Alarm message display

09-06-2003 09:54 Motor security	▲	Reset
22-04-2003 16:35 Exceeded pressure		
22-04-2003 15:34 Stop signal	▼	

If a malfunction occurs, the window will show the date, time and a short description of the malfunction. If an alarm output was also activated, then the background will appear in red. If no alarm outputs were activated or already reset, then the background will appear in grey.

The alarm outputs can be deactivated by pressing the `Reset` key. The background colour will then change from red to grey.
The message will remain in the window.
To clear the message from the window as well, press the `Reset` key once again.
A precondition for this is that the cause of the message has been removed. If this is not the case, then the message will stay.
It is also possible to have certain messages reset automatically (both alarm output and message).
This can be done in the programming of the corresponding input or measurement.

If there are more than 3 alarm messages, then the navigation buttons (▼ and ▲) will appear in the window to flip through the alarm messages.

The flow chart below illustrates how an alarm message can be manually reset.

```
              ┌─────────────────┐
              │  'Reset Alarm'  │
              └────────┬────────┘
                       │
            ◇ Alarm output ──No──◇ Alarm situation ──No──┐
              activated              resolved            │
                  │                     │                │
                 Yes                   Yes               │
                  │                     │                │
         ( Switch output off )  ( Reset alarm message. )  ( No action )
```
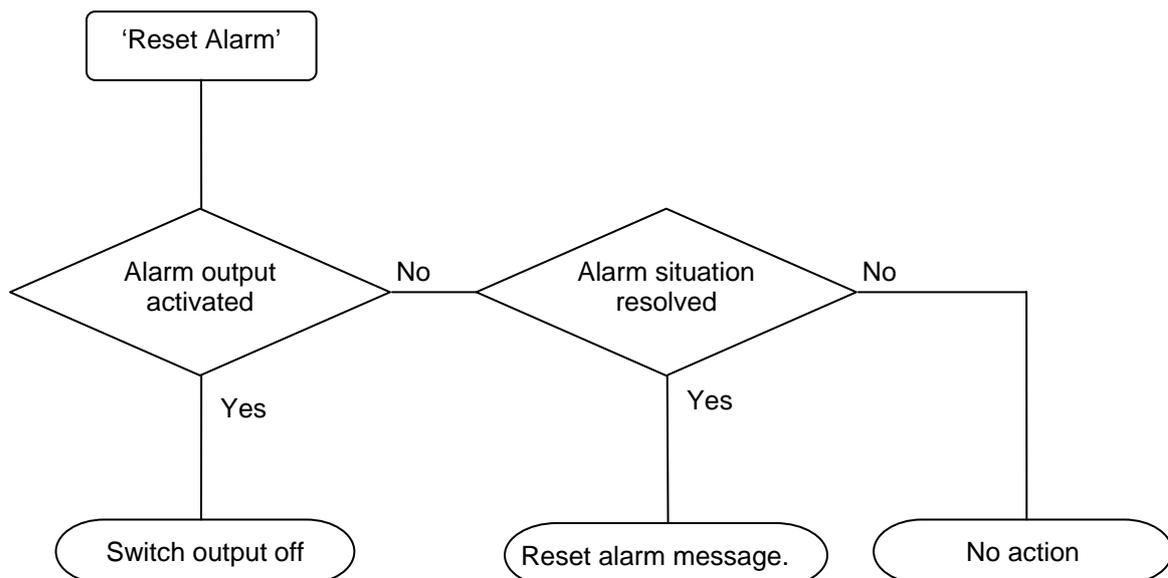
4. General operation

A "touch panel" on an LCD screen is used for the operation and programming of this controller. The sections below explain the general arrangement of the screen, the meaning of the various "buttons" and explanations of general display/input windows.

4.1 Main screen
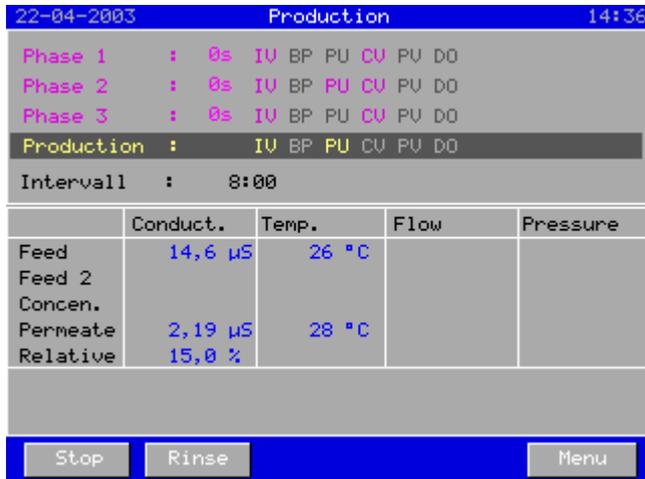
The main screen indicates the step that the system is in. It also displays the measurement values from the connected sensors, if this display has been activated.

A number of buttons appear in the lower bar. By pressing the `Menu` key, you can view the various settings and, if desired, modify them.

The other keys are for manual intervention into the system.

4.2 Menu screen
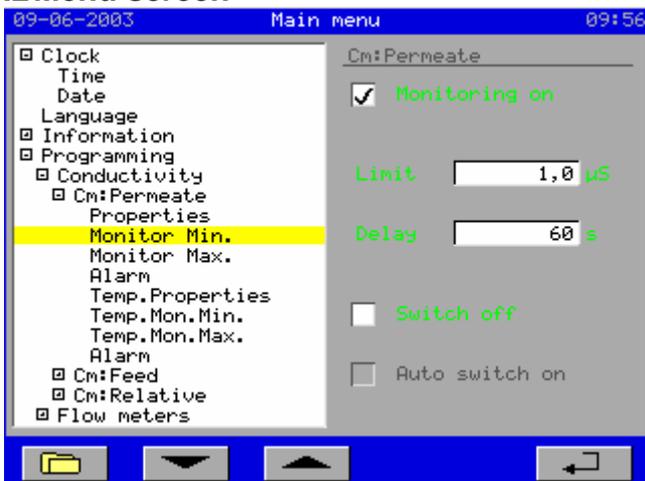
In the main menu, the screen is divided into two parts.
On the left, we have a kind of "folder" structure.
The right side indicates:
- subfolders (when the cursor bar is placed on folder)
- settings, if the cursor bar is not placed on a folder.

You can open a folder with the `📁` button.

The cursor bar can be moved with the `▼` and `▲` buttons.

To exit the main menu again, press the `↵` key.
The `✓` and `●` fields scan be modified by pressing on the relevant field. The section below describes how to change numeric values.

4.3 Changing numeric values
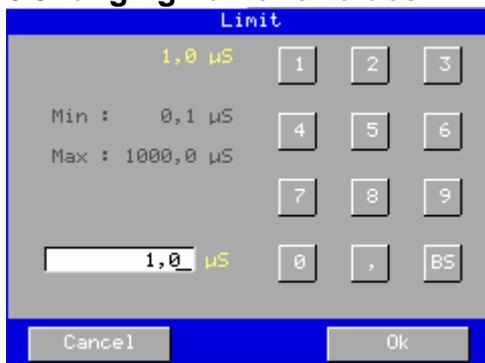
A number of numeric settings can be modified in the programming of the controller.
If you press on the numeric value, a numeric input window will appear.
The current value is displayed at the top. The minimum and maximum values are displayed below. In the input field, you can change the value using the numeric keypad.
The `BS` key can be used to erase a number that has been entered in.

The modified value can be confirmed by pressing the `Ok` key. If you do not wish to change the value, then press the `Cancel` key.

5 Manual operation of the system

It is possible to manually intervene in the system process.
The possibilities for each phase are described below.

5.1 Start "Production"

The "Production" phase can be started manually from the "Standby" phase and the "Rinse after production" phase with the `Prod.` key.
If the "Rinse during production" phase has been activated, then production can be resumed by pressing the `Stop` key.

5.2 Stop "Production"/Go to "Standby"

The "Standby" phase can be accessed by pressing the `Stop` key during the "Production" phase. If the "Rinse after production" phase has been programmed, then this phase will run through first before the "Standby" phase is activated. It is possible to stop the rinse manually by pressing the `Stop` key.

If the system is switched off manually while the levels switches still indicate that more desalinated water was requested, then the "process" window will display the message that the system was switched off manually.

5.3 Start "Maintenance"

The "Maintenance" phase can only be activated during the "Standby" phase. To do this, press the `Maint.` key. If a code number must be entered (see 10.1 Security codes on page 39), then a numeric input window will appear in which the correct code must be entered.
The maintenance steps are not activated immediately: the `Start` key must be pressed.

5.4 Stop "Rinse"

All rinse phases can be cut short manually by using the `Stop` key.
If this is done during "Rinse after Production", then the installation will go back into the "Production" phase. During the other two rinse phases, the system will revert back to "Standby".

5.5 Start "Rinse during standby"

If interval rinse during the "Standby" phase has been programmed, then this rinse can also be started manually by using the `Rinse` key.

5.6 Start "Rinse during production"

If interval rinse during the "Production" phase has been programmed, then this rinse can also be started manually by using the `Rinse` key.


5.7 Alarm reset

If an alarm message and/or alarm output has been activated, then this can be reset with the `Reset` key in the alarm message window. If an alarm output has been activated, then the output will be activated first. The alarm message will disappear if the cause of the alarm has been removed and the key is pressed again. (See § 3.4 "Alarm message display" on page 10).

6 Retrieve information

Various data can be retrieved via the information menu, such as: the software version, the service phone number, the number of service hours, the status of the inputs and outputs, the alarm history information, and the maintenance interval (if programmed).
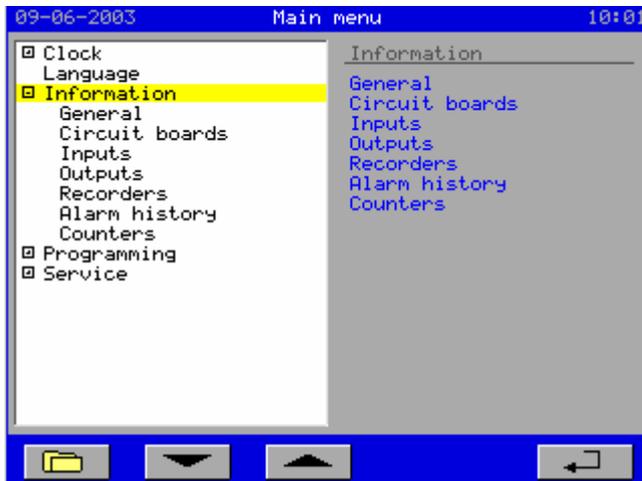
Move the cursor bar with the [▼] and [▲] navigation keys to the *"Information"* option. Open the *"Information"* folder by pressing the [📁] key.

6.1 Software version
The software is regularly updated in the factory. If necessary, modifications are implemented in order to adapt the product to new insights and demands.
The version number of the installed software is indicated in the display.
The software version is indicated in the *"Information – General"* option.

6.2 Service number
Service phone number information is indicated in the display. The service phone number can be programmed as described in § 10.3 "Set service phone number" on page 41.
The service phone number is indicated in the *"Information – General"* option.

6.3 Connected PCBs
The controller is made of multiple PCBs. The connected PCBs are indicated in the *"Information – General"* option. This allows you to check that the connected PCBs are actually being detected by the software.

The following PCBs may appear in the display:
- cb-4relp-3relf   (1)   : relay PCB number 1
                                     (4x powered relay + 3x non-powered relay)
- cb-1cm-1tm   (1)   : basic measurement PCB number 1
                                     (1x conductivity meter + 1x temperature)
- ca-1cm-1tm   : expansion PCB
                                     (1x conductivity meter + 1x temperature)
- ca-fl-pr-3an   (flow) : expansion PCB with 3 analogue power outputs (4-20mA)
                                     (3x flow measurement)
- ca-fl-pr-3an   (press.) : expansion PCB with 3 analogue power inputs (4-20mA)
                                     (3x pressure measurement)
- ca-4rec   : expansion PCB with 3 analogue power outputs (0-20mA)
                                     (3x recorder)

6.4 Inputs

This window displays the status of the inputs. The current status is updated every second.

Meaning of the indications:
- "No"   : The input is being checked but is not active or active for less than the programmed delay time.
- "Yes" : The input is being checked and is active longer than the programmed delay time.
- "---" : The input not being checked because e.g. the component has not been programmed or because, in the case of "low water pressure", the high pressure pump is not activated.

It also indicates whether the input is detecting an open or closed contact.
See § 9.6 "Switches" on page 29.

6.5 Outputs
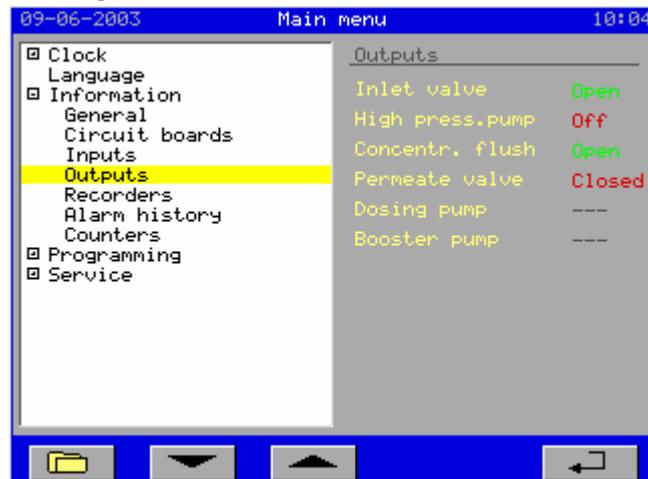
This window displays the status of the outputs. The current status is updated every second.

Meaning of the indications:
- "Open"   : The valve is open.
- "Closed"   : The valve is closed.
- "On"   : The pump is activated.
- "Off"   : The pump is switched off.
- "---"   : The corresponding output is not activated

See also § 9.7 "Valves" on page 33 and 9.8 "Pumps" on page 34

6.6 Recorders

This window displays the status of the power (recorder) outputs, if the optional recorder PCB has been installed.
The current status is updated every second.

The power output is indicated. If an output is not activated, then this is indicated by "xxx".

If the optional recorder PCB is not installed, then the outputs will indicate "xxx".

See also § 9.5 "Recorders" on page 27.

6.7 Alarm history

In this window, the *"Alarm History"* can be called up by pressing the "History" key.

This will open a window with an overview of the last 15 alarm messages.

The overview shows the time, date and a description of the alarm message. The last alarm is at the top.

These data are not lost during a power failure.

6.8 Service hours

The controller maintains a counter that registers the number of hours/minutes (hh:mm) during which the system has actually produced desalinated water.

This counter can be accessed under the option "*Information – Counters".*

6.9 Maintenance interval

You can program in a maintenance interval. This counter keeps track of the number of service hours between maintenance sessions. If this interval time is not activated, then this is indicated by ("No"). Otherwise, the remaining time (in minutes) until the next maintenance session is indicated.

This interval counter can be accessed under the option "*Information – Counters".*

7 Change language setting

The menu is accessed by pressing the [Menu] key in the main screen.

Move the cursor bar with the [▼] and [▲] navigation keys to the **"Language"** option. Open the **"Language"** folder by pressing the [📁] key.

The controller comes in various languages as standard. You can change the language of the display texts via **Menu – Language**.

Change the language
Select the desired language.
The display texts are immediately changed to the selected language.

8 Set clock

The current time and date can be modified in the *"Clock"* menu.
The menu is accessed by pressing the [Menu] key in the main screen.
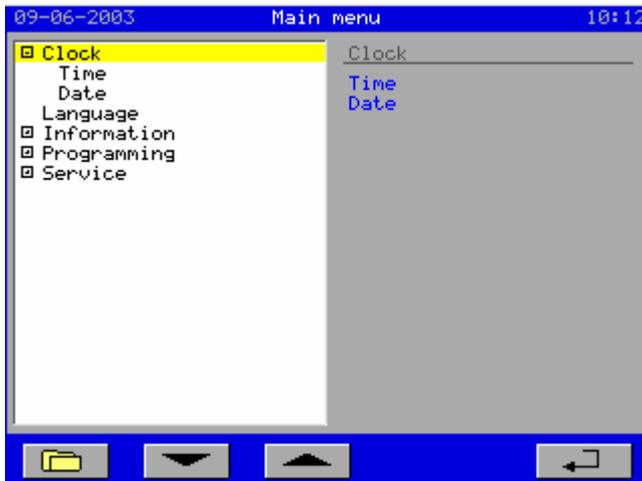
Move the cursor bar with the [▼] and [▲] navigation keys to the *"Clock"* option.
Open the *"Clock"* folder by pressing the [📁] key.

8.1 Time
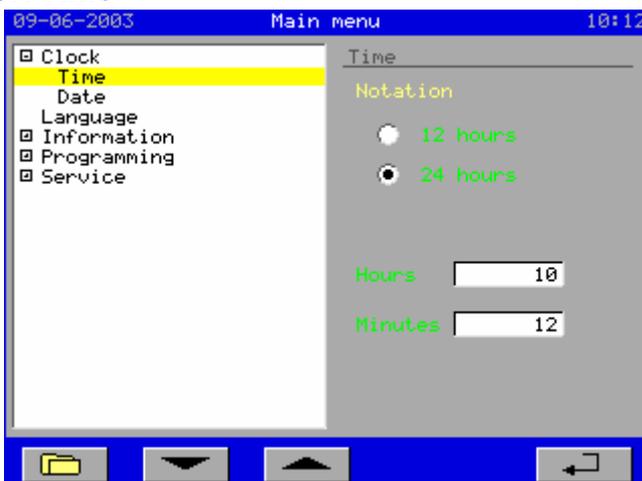
The clock display and current time can be set in the *"Time"* menu option.

Change display:
Select the desired display.

Change current time:
Press the window containing the parameter (hours or minutes) you want to change.
A numeric input window will appear in which you can adjust the hours/minutes. See § 4.3 "Changing numeric values" on page 11.

8.2 Date
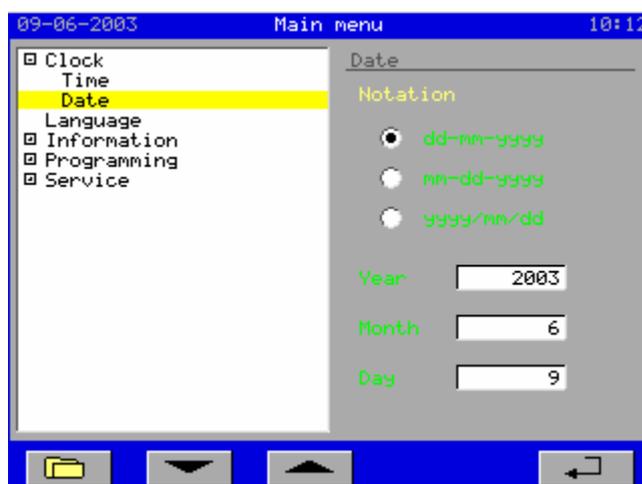
The date display can be set in the *"Date"* menu option.

Change display:
Select the desired display.

Change current date:
Press the window containing the parameter (year, month or day) you want to change.
A numeric input window will appear in which you can adjust the year, month or day. See § 4.3 "Changing numeric values" on page 11.

9 Programming

The following chapters describe how to program the controller.
For a complete summary of all menu options, see §13 " Menu Overview", page 50.

Caution: Some windows are only accessible if the optional PCB has been installed and activated in the component list (see § 10.2 "Inventory of connected components " on page 40) or according to the current setting.
In this case, this will also be indicated in the relevant window.

The menu is accessed by pressing the [Menu] key in the main screen.
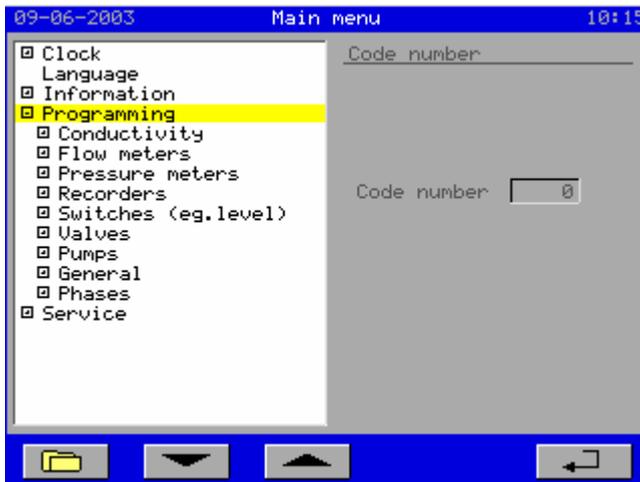
Move the cursor bar with the [▼] and [▲] navigation keys to the *"Programming"* option.
Open the *"Programming"* folder by pressing the [📁] key.

General menu navigation is described in § 4.2 "Menu screen" on page 11.

The following chapters detail the settings in the windows of the different folders.

9.1 Conductivity measurement

The settings for the conductivity meters are located inside the *"Programming – Conductivity"* folder.
This folder is subdivided into the conductivity meter for the permeate, feed and the relative conductivity. Since the temperature sensors are related to the conductivity measurement, these are also located under the corresponding conductivity meter.

9.1.1 Permeate conductivity measurement

Properties
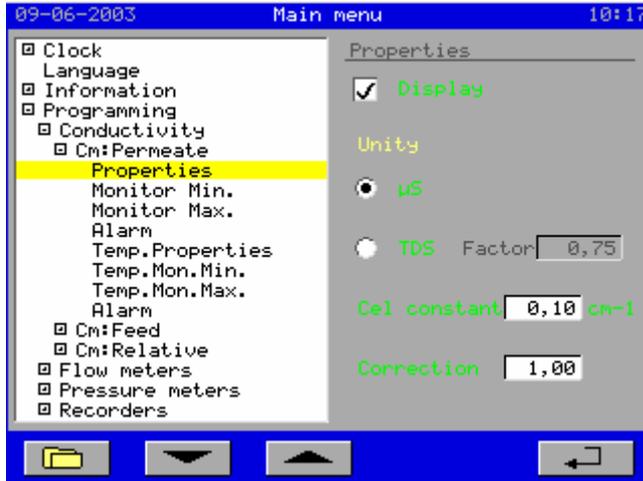
The properties of the connected measuring cells must be entered in this window.

Under the *"Display"* option, you can select whether the measured value will be displayed in the main screen.

Measurement range calculation

$Range_{min}$ = cell constant * 10 µS/cm
$Range_{max}$ = cell constant * 10 mS/cm
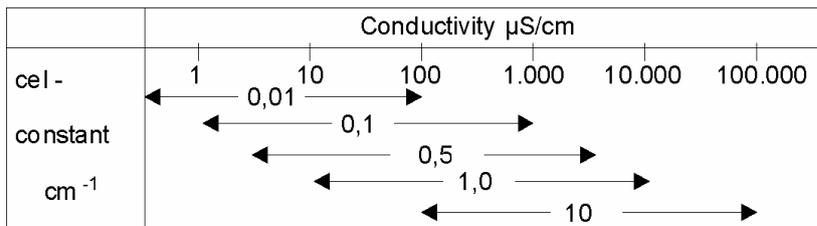
Table: measurement range for cell constants

Monitoring of minimum conductivity:
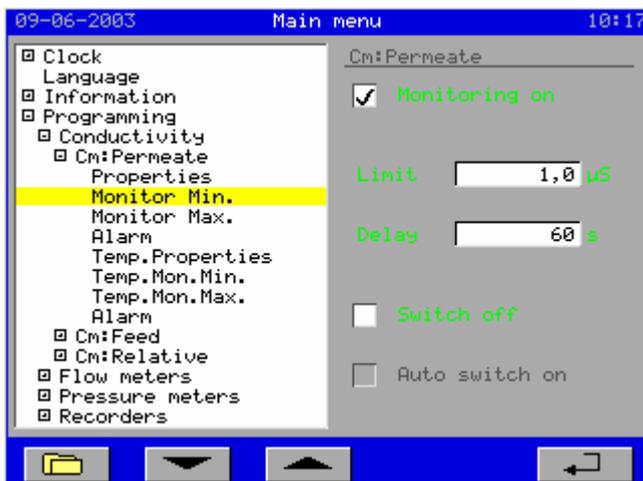
In this window, you can activate the monitoring of the minimum conductivity.

You can also set whether the system should switch off *"Switch off"* in the case of insufficient conductivity and, if so, you can also indicate whether the system should switch back on automatically once minimum conductivity has been restored *"Auto.Switch on"*.

Monitoring of maximum conductivity
This window is the same as the one above except that it is for maximum conductivity.

Conductivity alarm
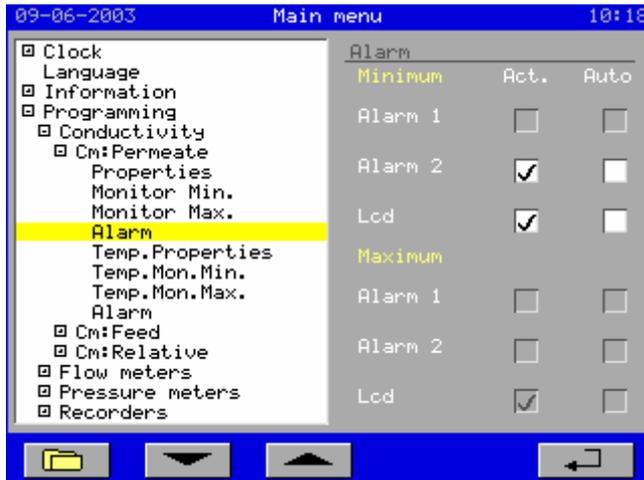
In this window, you can set whether a message should appear in the "alarm window" ("*LCD*" Act. option) and whether an alarm output should be activated in the event of a faulty measurement value.

Under the "*Auto*" header, you can set whether the output and message should be automatically deactivated once the cause of the malfunction is removed.

"Alarm 1" can only be programmed if output 6 has not been programmed for a booster pump and the Alarm 1 function is activated (see 10.2 "Inventory of connected components " on page 40).

Temperature properties
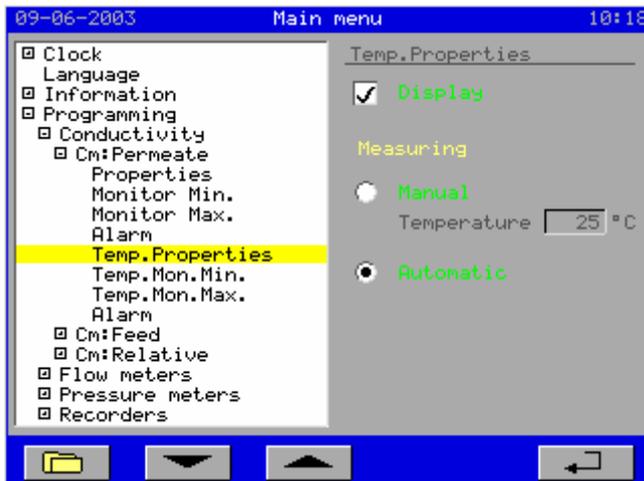
The properties of the connected temperature sensors must be entered in this window.

Under the *"Display"* option, you can select whether the measured value will be displayed in the main screen.

If no temperature sensors are connected, then the manual value will be kept (even if the set measurement value is set to automatic).

Monitoring of minimum temperature
This window contains the same settings as indicated for "Monitoring of minimum conductivity" on the previous page except that they are for the minimum temperature.

Monitoring of maximum temperature
This window contains the same settings as indicated for "Monitoring of minimum conductivity" on the previous page except that they are for the maximum temperature.

Temperature alarm
This window contains the same settings as indicated for "Conductivity alarm" on the previous page except that they are for the temperature.

9.1.2 Feed conductivity measurement

The windows for this measurement are the same as those of the conductivity measurement for permeate except that they are for the measurement conductivity in the incoming water line.
(See § 9.1.1 "Permeate conductivity measurement" on page 19).

These windows are only accessible if the optional PCB (ca-1cm-1tm) for the 2nd conductivity measurement is installed. See § 19 ". Installation of optional PCBs" on page 56.

9.1.3 Relative conductivity

The settings for the relative conductivity are only accessible if the optional PCB for the 2nd conductivity measurement is installed. See § 19 ". Installation of optional PCBs" on page 56.

Properties

Under the *"Display"* option, you can select whether the measured value will be displayed in the main screen.

The relative conductivity will appear in the main screen under the header "Concentrate".

Monitoring of minimum relative conductivity:

In this window, you can activate the monitoring of the minimum relative conductivity.

You can also select whether the system should switch off **"Switch off"** in the case of insufficient relative conductivity and, if so, you can also select whether the system should switch back on automatically once the relative conductivity has been restored **"Auto.Switch on"**.

Monitoring of maximum relative conductivity
This window is the same as the one above except that it is for maximum conductivity.
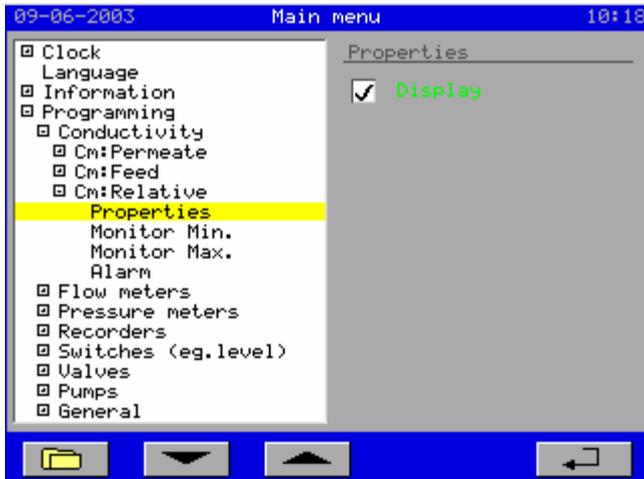
Relative conductivity alarm

In this window, you can set whether a message should appear in the "alarm window" ("*LCD*" Act. option) and whether an alarm output should be activated in the event of a faulty measurement value.

Under the "*Auto*" header, you can set whether the output and message should be automatically deactivated once the cause of the malfunction is removed.

"Alarm 1" can only be programmed if output 6 has not been programmed for a booster pump and the Alarm 1 function is activated (see 10.2 "Inventory of connected components " on page 40).

9.2 Temperature measurement

Since the temperature sensors are related to the conductivity measurement, these are also located in the folder of the corresponding conductivity meter.
(See § 9.1.1 "Permeate conductivity measurement" on page 19 and § 9.1.2 "Feed conductivity measurement" on page 20).

The measured temperature is used to compensate the corresponding measured conductivity.
The correction factors appear in the chart below.

Temperature compensation
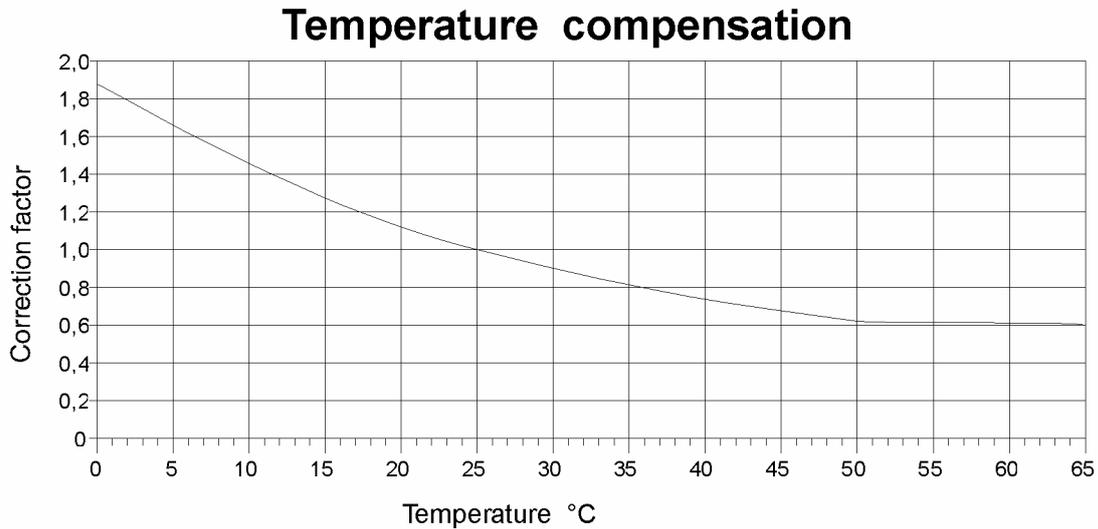
PT1000s should be used for temperature sensors.

9.3 Flow measurement

The optional PCB (ca-fl-pr-3an) must be installed for the flow measurement. See § 19 ". Installation of optional PCBs" on page 56.
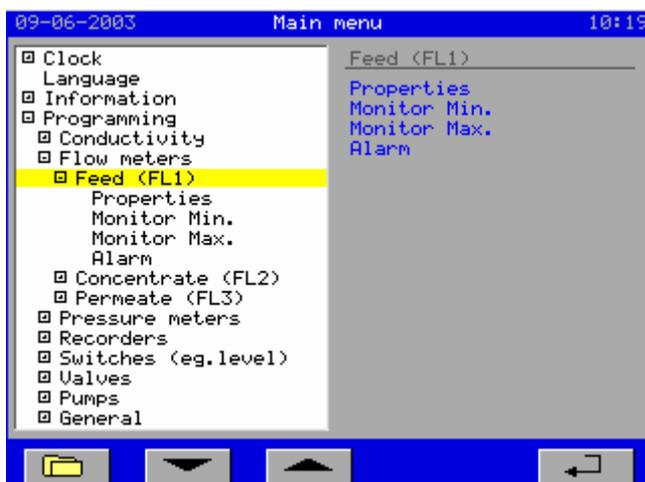
The settings for the flow meters are located inside the **"Programming – Flow meters"** folder. This folder is subdivided into the flow measurement for the feed, the concentrate and the permeate.

In these folders, you can adjust the properties for the connected flow meters as well as the monitoring of the minimum and maximum flow and the alarms.

9.3.1 Feed flow measurement

Properties
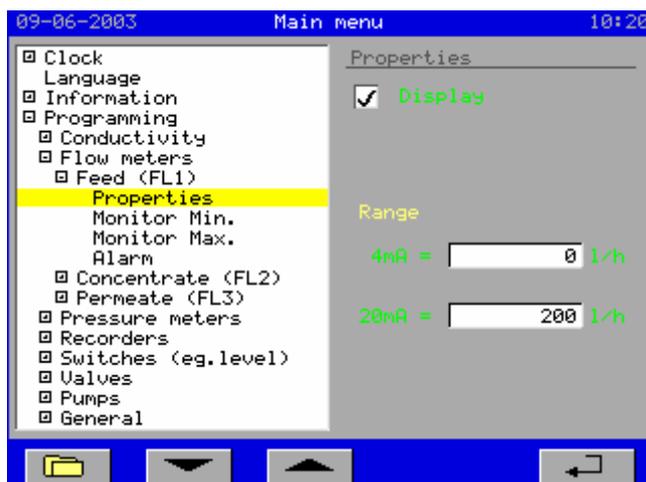
The properties of the connected flow meters must be entered in this window.

Under the **"Display"** option, you can select whether the measured value will be displayed in the main screen.

Monitoring of minimum flow

In this window, you can activate the monitoring of the minimum flow.

You can also select whether the system should switch off in the case of an insufficient flow.
In this case, the system must always be switched back on manually.

<u>Monitoring of maximum flow</u>
This window contains the same settings as indicated for "Monitoring of minimum flow" on the previous page except that they are for the maximum flow.

<u>Flow alarm</u>
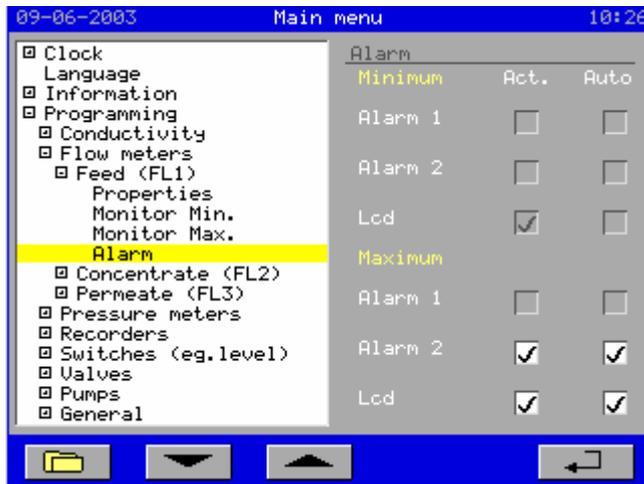
In this window, you can set whether a message should appear in the "alarm window" ("*LCD*" Act. option) and whether an alarm output should be activated in the event of a faulty limit value.

Under the "*Auto*" header, you can set whether the output and message should be automatically deactivated once the cause of the malfunction is removed.

"Alarm 1" can only be programmed if output 6 has not been programmed for a booster pump and the Alarm 1 function is activated (see 10.2 "Inventory of connected components " on page 40).

9.3.2 Concentrate flow measurement

The windows for this measurement are the same as those of the flow measurement for feed except that they are for the measured flow in the concentrate line. (See § 9.3.1 "Feed flow measurement" on page 23).

9.3.3 Permeate flow measurement

The windows for this measurement are the same as those of the flow measurement for feed except that they are for the measured flow in the permeate line. (See § 9.3.1 "Feed flow measurement" on page 23).

9.4 Pressure measurement

The optional PCB (ca-fl-pr-3an) must be installed for the pressure measurement. See § 19 ".
Installation of optional PCBs" on page 56.

The settings for the pressure meters are located inside the *"Programming – Pressure meters"* folder. This folder is subdivided into the pressure measurement for the feed, the concentrate and the permeate.

In these folders, you can adjust the properties for the connected pressure meters as well as the monitoring of the minimum and maximum pressure and the alarms.

9.4.1　Feed pressure measurement

Properties
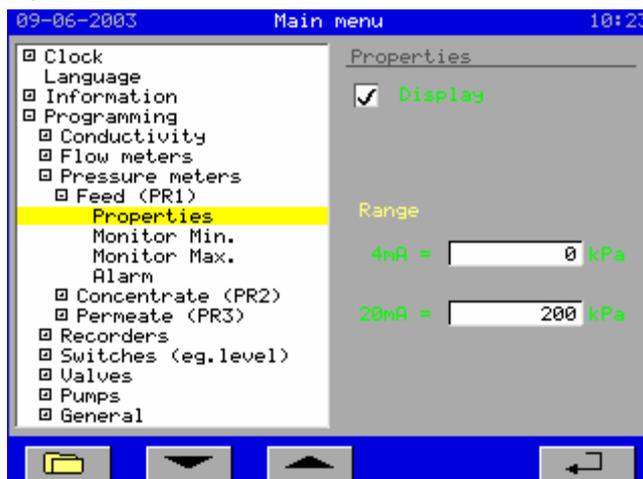
The properties of the connected pressure meters must be entered in this window.

Under the *"Display"* option, you can select whether the measured value will be displayed in the main screen.

Monitoring of minimum pressure
The minimum pressure is only monitored if the high pressure pump and/or booster pump are activated.
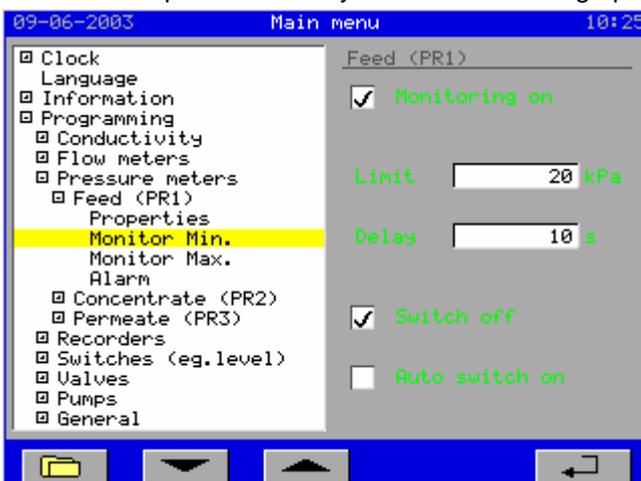
In this window, you can activate the monitoring of the minimum pressure.

You can also select whether the system should switch off in the case of insufficient pressure and, if so, you can also select whether the system should switch back on automatically once flow has been restored.

Monitoring of maximum pressure
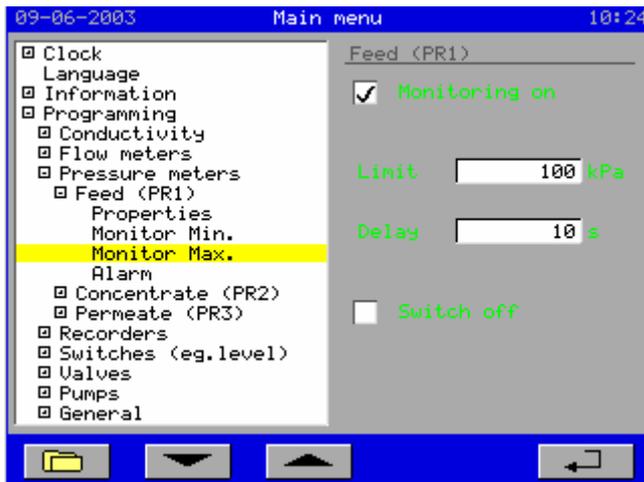
In this window, you can activate the monitoring of the minimum pressure.

You can also select whether the system should switch off in the case of excessive pressure.
In this case, the system must always be switched back on manually.

Pressure alarm
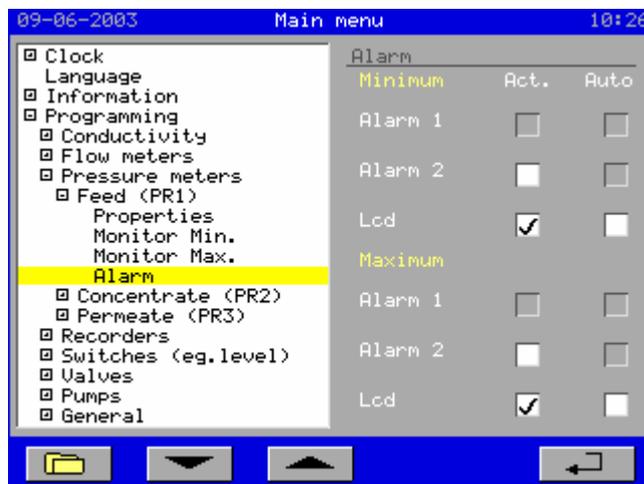
In this window, you can set whether a message should appear in the "alarm window" ("*LCD*" Act. option) and whether an alarm output should be activated in the event of a faulty measurement value.

Under the *"Auto*." header, you can set whether the output and message should be automatically deactivated once the cause of the malfunction is removed.

"Alarm 1" can only be programmed if output 6 has not been programmed for a booster pump and the Alarm 1 function is activated (see 10.2 "Inventory of connected components " on page 40).

9.4.2 Concentrate pressure measurement

The windows for this measurement are the same as those of the flow measurement for feed except that they are for the measured flow in the concentrate line.(See § 9.4.1 "Feed pressure measurement" on page 25).

9.4.3 Permeate pressure measurement

The windows for this measurement are the same as those of the pressure measurement for feed except that they are for the measured pressure in the permeate line. (See § 9.4.1 "Feed pressure measurement" on page 25).

9.4.4 2. Feed pressure measurement

Instead of the pressure measurement on the permeate side, you can use this 3. pressur meter input for a second measurement in the feed. This you can program in "*Menu - Service – Components*". (See § 10.2 "Inventory of connected components" on page 40).

9.5 Recorders

The optional PCB (ca-4rec) must be installed for the pressure measurements. See § 19 ". Installation of optional PCBs" on page 56.
Recorders can be used with a current input of 0-20 mA or 4-20 mA.
All measurement values can be displayed on the recorder output. If multiple measurement values are selected on a single output, then these alternate every 2 seconds.
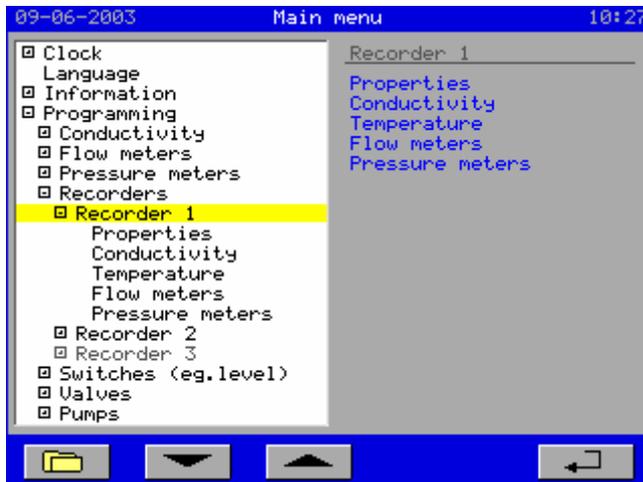
The settings for the recorder outputs are located inside the *"Programming – Recorders"* folder.
This folder is subdivided into three outputs (Recorders 1, 2 and 3).

In these folders, you can adjust the properties of the connected recorders as well as which parameters are displayed for the outputs.

9.5.1 Recorder output 1

Properties
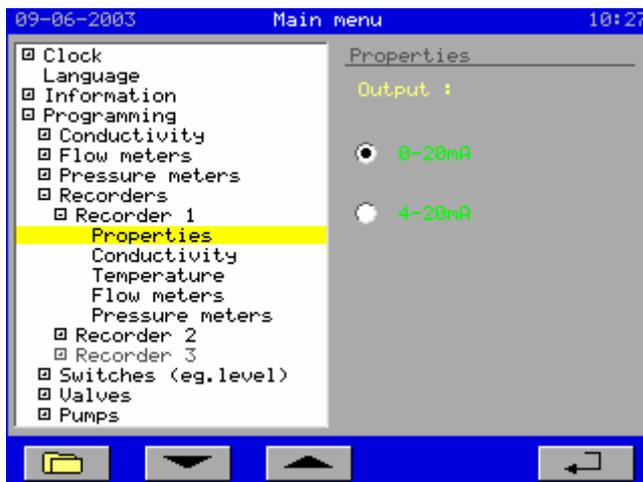
The properties of the connected recorders must be entered in this window.

You can select whether the connected recorder has an input of 0-20 mA or 4-20 mA.

Conductivity
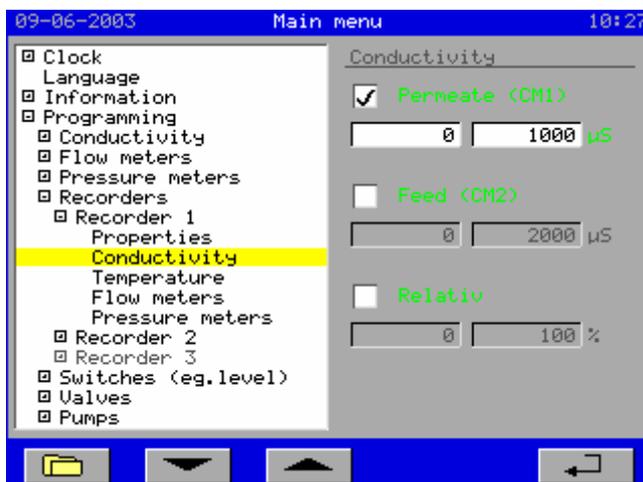
In this window, you can set which conductivity measurements should be displayed on the output.

Also, the current range can be linked to a range of the measured conductivity.

In the 1st numeric input field, you can enter in the measurement value up to which the output will switch the minimum current (0 or 4mA).
In the 2nd numeric input field, you can enter in the measurement value at which the maximum output current will be switched.

Temperature
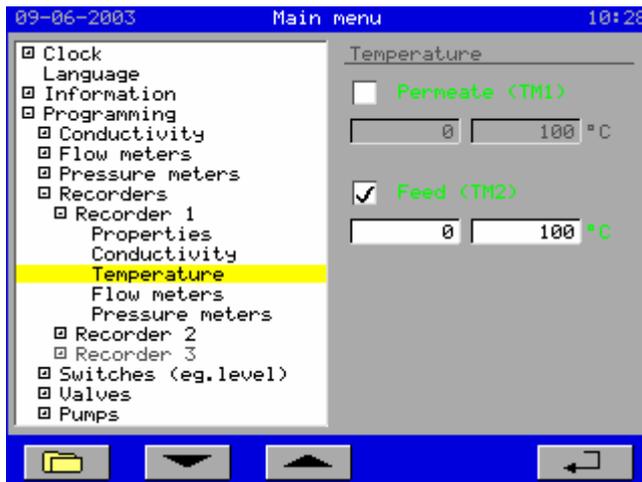
In this window, you can set which temperature measurements should be displayed on the output.

Also, the current range can be linked to a range of the measured temperature.

In the 1st numeric input field, you can enter in the measurement value up to which the output will switch the minimum current (0 or 4mA).
In the 2nd numeric input field, you can enter in the measurement value at which the maximum output current will be switched.

Flow measurement
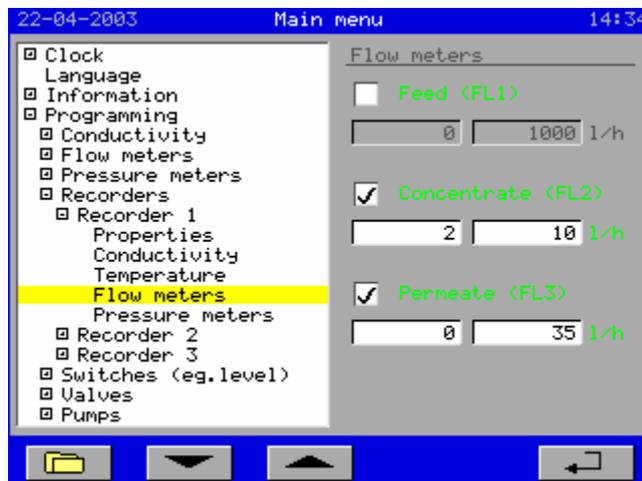
In this window, you can set which flow measurements should be displayed on the output.

Also, the current range can be linked to a range of the measured flow.

In the 1st numeric input field, you can enter in the measurement value up to which the output will switch the minimum current (0 or 4mA).
In the 2nd numeric input field, you can enter in the measurement value at which the maximum output current will be switched.

Pressure measurement
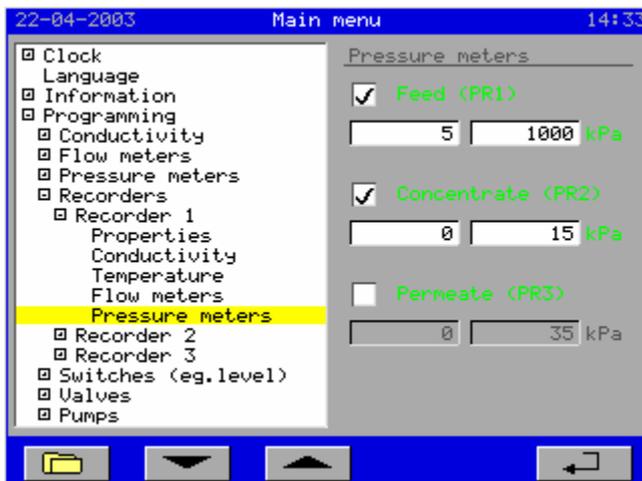
In this window, you can set which pressure measurements should be displayed on the output.

Also, the current range can be linked to a range of the measured pressure.

In the 1st numeric input field, you can enter in the measurement value up to which the output will switch the minimum current (0 or 4mA).
In the 2nd numeric input field, you can enter in the measurement value at which the maximum output current will be switched.

9.5.2 Recorder output 2
The windows for recorder output 2 are the same as those for recorder output 1 (See § 9.5.1 "Recorder output 1" on page 27).

9.5.3 Recorder output 3
The windows for recorder output 2 are the same as those for recorder output 1 (See § 9.5.1 "Recorder output 1" on page 27).

9.6 Switches

The controller comes standard with eight inputs to which potential-free switches can be connected.
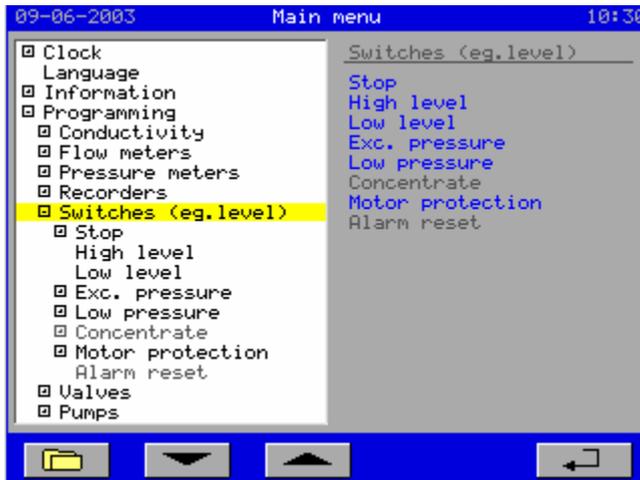
The settings for the switches are located inside the *"Programming – Switches"* folder. This folder is subdivided into the connectable switches, viz.:
- Stop
- High level switch
- Low level switch
- Exceeded pressure
- Low pre-pressure
- Concentrate
- Motor security
- Alarm reset

The chapters below detail the inputs listed above.

9.6.1 Stop

Properties
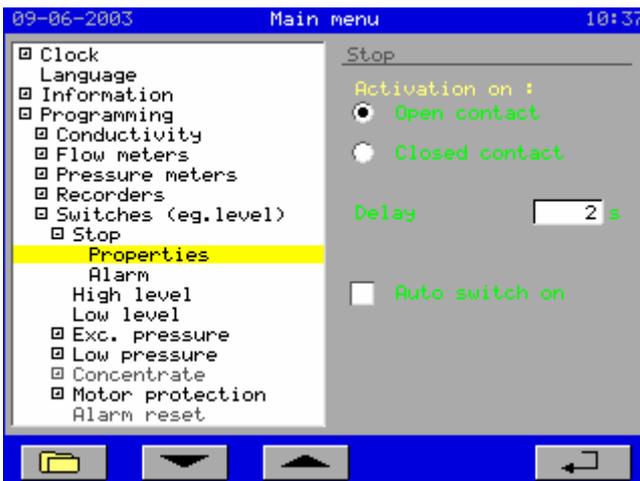
In this window, you must set the properties for the "stop" switch.
You can select whether the function is to be activated for an open or closed input contact.

You can also program in a delay. If the input is activated for this period of time, then the controller will react to this.

You can also indicate that the system should switch back on automatically once the malfunction is resolved.

Alarms

In this window, you can set whether a message should appear in the "alarm window" ("*LCD*" Act. option) and whether an alarm output should be activated in the event of a faulty limit value.

Under the "*Auto*" header, you can set whether the output and message should be automatically deactivated once the cause of the malfunction is removed.

"Alarm 1" can only be programmed if output 6 has not been programmed for a booster pump and the Alarm 1 function is activated (see 10.2 "Inventory of connected components " on page 40).

9.6.2 High level switch

In this window, you must set the properties for the "high level" switch in the storage tank.

You can select whether the function is to be activated for an open or closed input contact.

You can also program in a delay. If the input is activated for this period of time, then the controller will react to this.

The controller will only react to the high level switch if it has been activated in the components list (see 10.2 "Inventory of connected components " on page 40). The system will automatically switch off when the input is activated (storage tank full).

9.6.3 Low level switch

In this window, you must set the properties for the "low level" switch in the storage tank.

You can select whether the function is to be activated for an open or closed input contact.

You can also program in a delay.

The controller will only react to the low level switch if both the high and low level switches have been activated in the components list (see 10.2 "Inventory of connected components " on page 40).

The system will switch on automatically if the high level switch is not active and the low level switch is active (storage tank empty).

However, if the system was switched off manually during production, then it will also need to be switched back on manually. The "process" window will indicate whether the system was switched off manually (see also § 3.1 "Process phase display" on page 9).

9.6.4 Exceeded pressure

Properties

In this window, you must set the properties for the "exceeded pressure" switch.

You can select whether the function is to be activated for an open or closed input contact.

You can also program in a delay. If the input is activated for this period of time, then the controller will react to this.

The system must always be switched back on manually.

Alarms

The windows for the alarms are the same as those for stop input (See § 9.6.1 "Stop" on page 29).

9.6.5 Low water pressure

This input function is meant to prevent the high pressure pump and/or booster pump from running dry. The input is only monitored if one or both of them are activated.

Properties
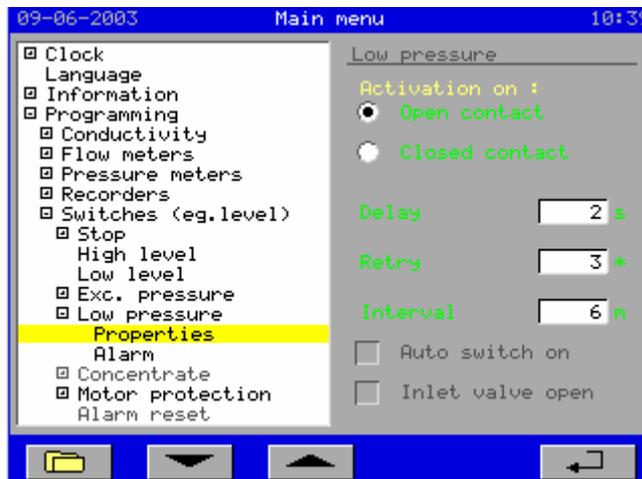
In this window, you must set the properties for the "low water pressure" switch.

You can select whether the function is to be activated for an open or closed input contact.

You can also program in a delay. If the input is activated for this period of time, then the controller will react to this.

If the number of attempts is set to 0, then you can select whether the system will switch back on automatically when there is enough water. If an inlet valve is being used, then you can select whether this valve should stay open during the alarm situation **"Inlets.o.vlv.open"**

If the number of attempts is set to 1 or more, then the system will automatically switch back on after a specific period of time to check whether sufficient water pressure has become available.
Monitoring will only be reactivated if at least one pump is switched on. If the malfunction persists, then, after the set amount of attempts, the system will switch off and will have to be manually restarted.
The counter for the number of attempts will only be set back to zero if there is sufficient water pressure for the duration of the delay period plus one second (with activated pump).

Alarms

The windows for the alarms are the same as those for stop input (See § 9.6.1 "Stop" on page 29).
Any alarm relay and message in the "alarm" window that have been programmed will not be activated until the set number of attempts is reached.

9.6.6 Concentrate

This input function serves to monitor the flow through the concentrate line.
The input is only monitored if the high pressure pump and/or booster pump is activated.
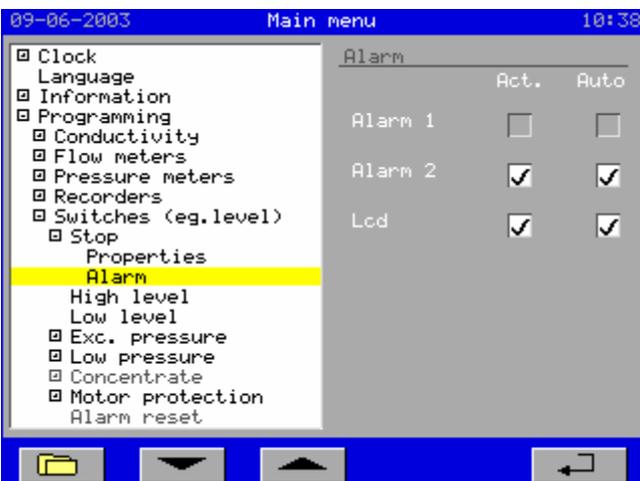
Properties
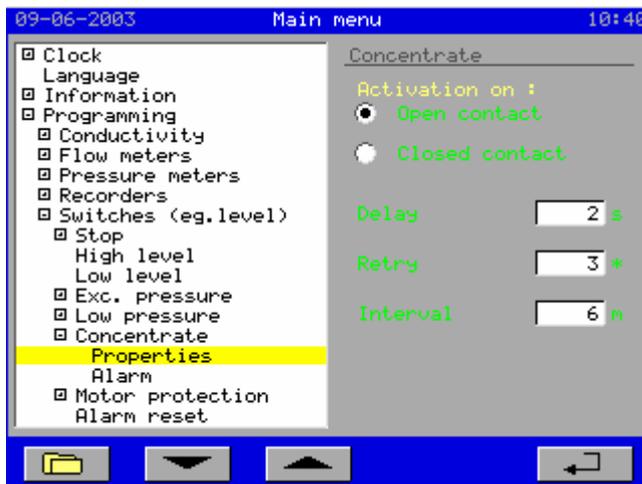
In this window, you must set the properties for the "concentrate" switch.

You can select whether the function is to be activated for an open or closed input contact.
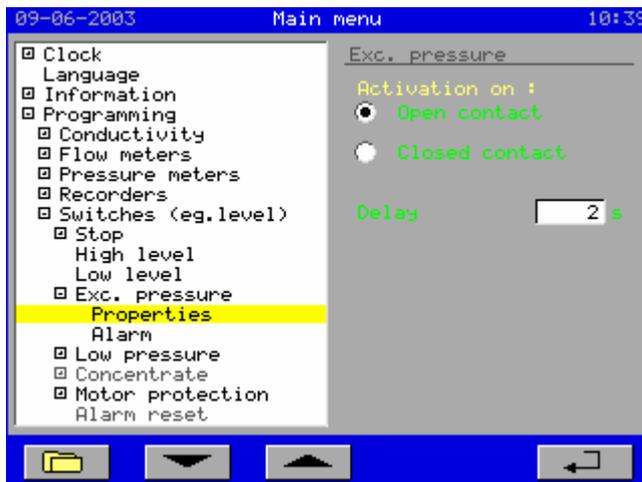
You can also program in a delay. If the input is activated for this period of time, then the controller will react to this.

You can set the number of attempts to be made to check whether there is sufficient flow through the concentrate line. The attempts are made at a programmable time interval.
Monitoring will only be reactivated if at least one pump is switched on. If the malfunction persists, then, after the set amount of attempts, the system will switch off and will have to be manually restarted.
The counter for the number of attempts will only be set back to zero if there is sufficient flow for the duration of the delay period plus one second (with activated pump).

Alarms
The windows for the alarms are the same as those for stop input (See § 9.6.1 "Stop" on page 29).
Any alarm relay and message in the "alarm" window that have been programmed will not be activated until the set number of attempts is reached.

9.6.7 Motor security

Properties
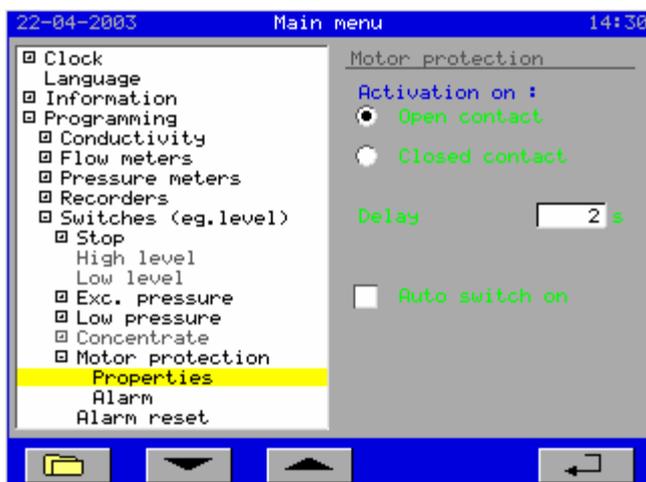
In this window, you must set the properties for the "motor security" switch.

You can select whether the function is to be activated for an open or closed input contact.

You can also program in a delay. If the input is activated for this period of time, then the controller will react to this.

You can also indicate that the system should switch back on automatically once the malfunction is resolved.

Alarms
The windows for the alarms are the same as those for stop input (See § 9.6.1 "Stop" on page 29).

9.6.8 Alarm reset

This input function enables the remote resetting of the alarms.
The alarm outputs are switched off if the input is activated. Also, the messages in the "alarm" window will be erased when the cause of the malfunction is no longer present.
If however the cause is still present, then the message will remain in the LCD display. It can be erased by sending another pulse on the input if the cause has been removed.
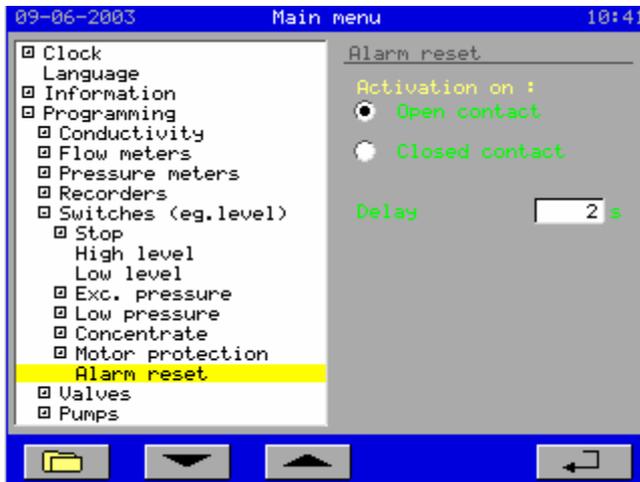
In this window, you must set the properties for the "alarm reset" switch.

You can select whether the function is to be activated for an open or closed input contact.

You can also program in a delay. If the input is activated for this period of time, then the controller will react to this.

9.7 Valves

The controller comes standard with seven relay outputs to which e.g. shut-off valves can be connected. Settings are only necessary for the permeate shut-off valve.

9.7.1 Permeate valve

The permeate shut-off valve can be activated during the different phases (see e.g. § 9.10.1 ""Production" phase" on page 35).
If the function of the permeate shut-off valve has been activated during the "Production" phase (after the start up phase!!), then the shut-off valve will be dependent on the measured conductivity in the permeate line.
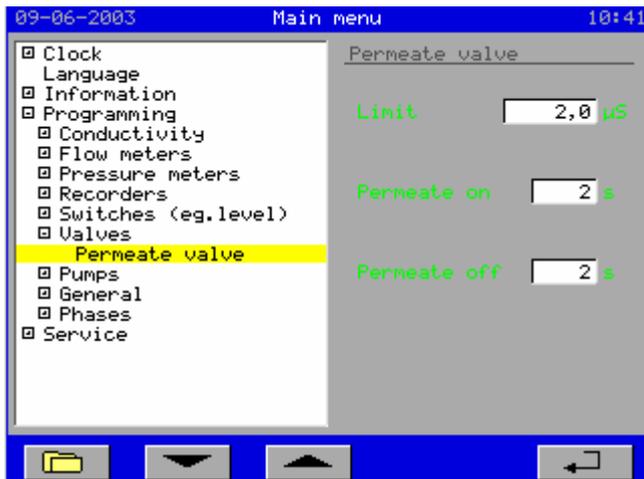
In this window, you can set the limit values for the measured conductivity at which the permeate function should be activated.

Also, a separate delay time can be entered in for switch on (permeate on) and switch off (permeate off).

The output function will be activated if the measured conductivity exceeds the set limit value for the duration of the "permeate on" delay period and will automatically deactivate if the conductivity drops back under the limit value for the duration of the "permeate off" delay period.

Caution: The relay for the permeate shut-off valve is energized if the "permeate" function is not active. Therefore, a "normally open" permeate rinse valve must be connected to (orange) terminals 11 and 12.

9.8 Pumps

The controller comes standard with seven relay inputs to which e.g. pumps can be connected. Settings are only necessary for the dosing pump.

9.8.1 Dosing pump

The dosing pump can be activated during the different phases (see e.g. § 9.10.1 ""Production" phase" on page 35).
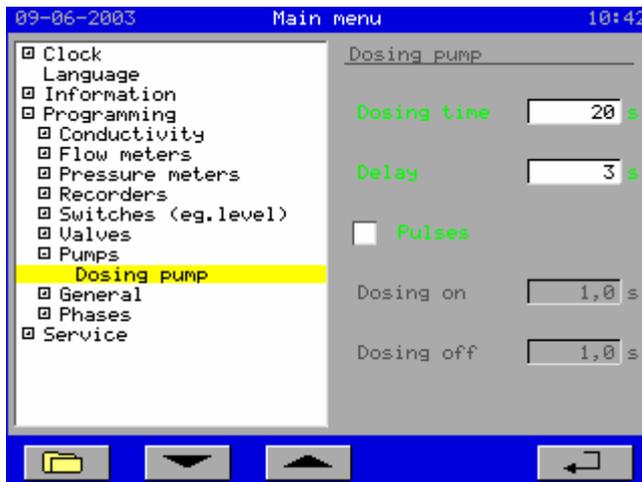
In this window, the dosing time can be set with a delay after the start of the phase. If the dosing time is set to zero, then dosing will last until the end of the phase.

A pulsing output can be generated using the "*Pulse*" option.
The pulse time and interval time can be entered in under the "*Dosing on*" and "*Dosing off*" options, respectively.

9.9 General Information

This section covers general settings.

9.9.1 Power failure

Here, you can set whether a message must be given if the power supply of the controller cuts out.
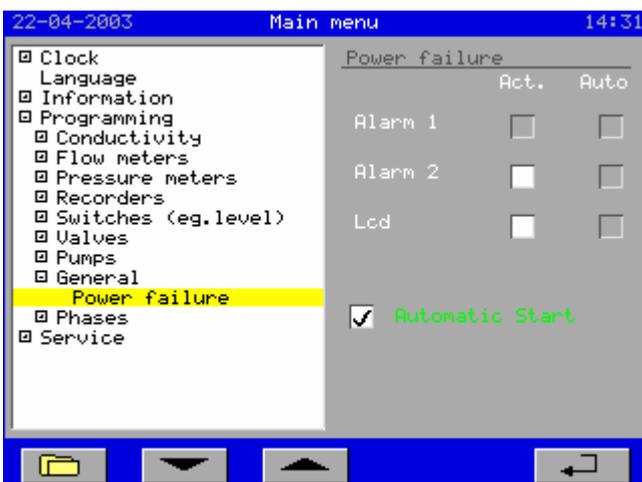
In this window, you can set whether a message should appear in the "alarm window" ("*LCD*" Act. option) and whether an alarm output should be activated in the event of a power failure.

Under the "*Auto*" header, you can set whether the output and message should be automatically deactivated once the cause of the malfunction is removed.

"Alarm 1" can only be programmed if output 6 has not been programmed for a booster pump and the Alarm 1 function is activated (see 10.2 "Inventory of connected components " on page 40).

You can program if the installation will start up automatically after a power failure (Automatic Start : on) or if you have to start it manually (Automatic Start : off).

9.10 Phases

The controller comes standard with a number of phases (processes).

The settings for the different phases are located inside the **"Programming – Phases"** folder. This folder is subdivided into the various phases, viz.:
- Production
- Rinse after production
- Rinse during production
- Rinse during standby
- Maintenance

In the "Standby" phase, all outputs are deactivated (except for the alarm outputs) and only the level switches are monitored. No additional settings are needed for this.

The chapters below detail the phases listed above.

9.10.1 "Production" phase

Desalinated water is produced during this phase.

Steps

In this window, you can set the output functions to be activated for each "sub"-phase.
The duration of the 1st three start-up phases can be given.

During the 1st three start-up phases, the permeate shut-off valve will be immediately opened or closed. During the actual production, the permeate shut-off valve will be opened or closed depending on the measured conductivity (see also § 9.7.1 "Permeate valve" on page 33).

Flow control

In the "**Programming - Flow meters**" options (§ 9.3 "Flow measurement" 23), the monitoring must be activated for a flow measurement.

In this window, you can set the monitoring that should be activated during the actual production.

During start-up phases 1, 2, and 3, the monitoring of the flow meters is switched off by default.

9.10.2 "Rinse after production" phase

This phase is used e.g. to purge out the concentrate after completion of the production of desalinated water.

Properties

You can set whether a membrane rinse will occur after the production of desalinated water has stopped.

Steps

In this window, you can set the output functions to be activated for each "sub"-phase.
The duration of the three start-up phases can be given.

Flow control
This window is the same as the window described in § 9.10.1 ""Production" phase" on page 35 and applies for the 3rd phase of the rinse.
In phase 1 and phase 2, the monitoring of the flow measurement is deactivated by default.

9.10.3 "Rinse during production" phase

This phase is used e.g. to carry out an extra rinse during longer desalinated water production sessions with highly corrosive water.

Properties
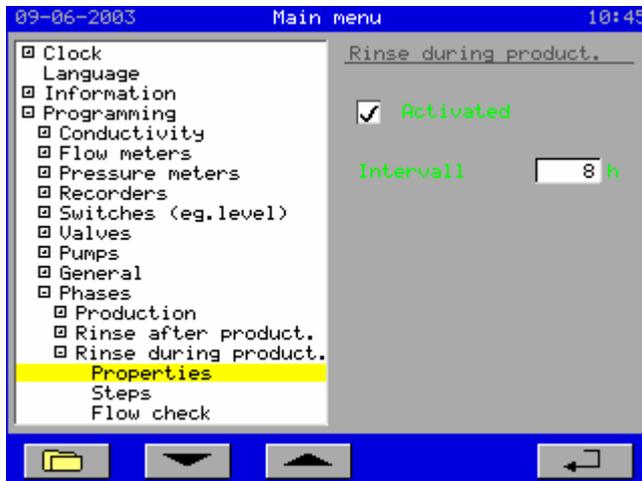
You can set whether a membrane rinse will occur during the production of desalinated water.

If the rinse is activated, then you must set a time interval between each rinse.

Steps
This window is the same as the window described in § 9.10.2 ""Rinse after production" phase" on page 36.

Flow control
This window is the same as the window described in § 9.10.1 ""Production" phase" on page 35 and applies for the 3rd phase of the rinse.
In phase 1 and phase 2, the monitoring of the flow measurement is deactivated by default.

9.10.4 "Rinse during standby" phase

This phase is used e.g. to prevent the osmosis module from being attacked by harmful micro-organisms during longer standby periods.

Properties
This window is the same as the window described in § 9.10.3 ""Rinse during production" phase" on page 37.

Steps
This window is the same as the window described in § 9.10.2 ""Rinse after production" phase" on page 36.

Flow control
This window is the same as the window described in § 9.10.1 ""Production" phase" on page 35 and applies for the 3rd phase of the rinse.
In phase 1 and phase 2, the monitoring of the flow measurement is deactivated by default.

9.10.5 "Maintenance" phase

In this phase, the system can be switched on and off e.g. in order to clean the osmosis module with special solutions.

The programming of the maintenance steps can be locked with a security code. This security code can be activated as described in § 10.1 "Security codes" on page 39.
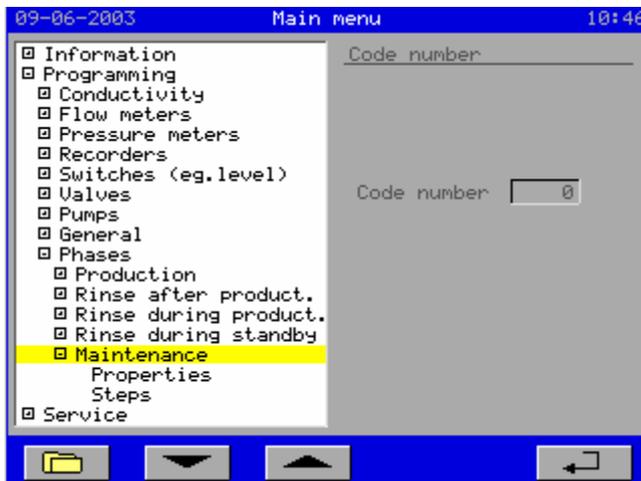
Properties
The maintenance interval can be activated in this window. The counter will not reset until maintenance has been performed.
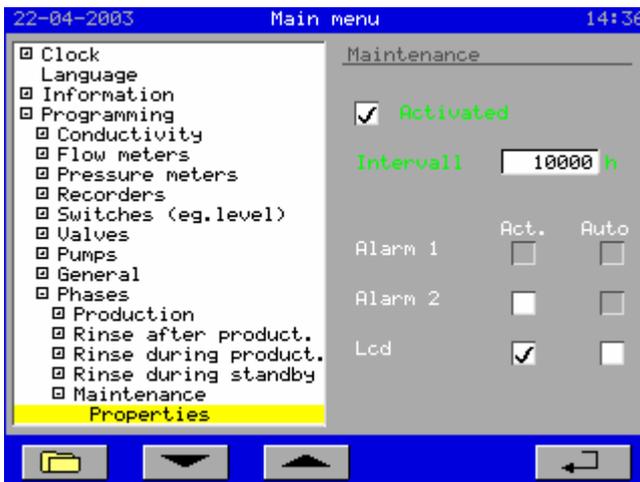
Also, you can set whether a message should appear in the "alarm window" ("**LCD**" Act. option) and whether an alarm output should be activated if the interval time is reached.

Under the "**Auto.**" header, you can set whether the output and message should be automatically deactivated once the maintenance has been performed.

"Alarm 1" can only be programmed if output 6 has been programmed for a booster pump and the Alarm 1 function is activated (see 10.2 "Inventory of connected components " on page 40).

Steps
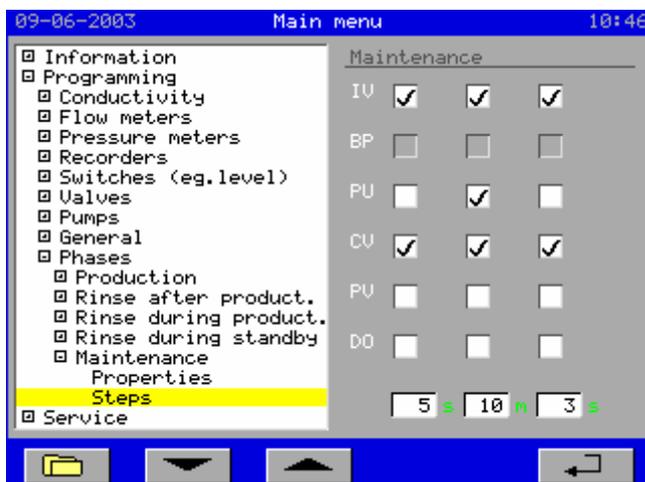
In this window, you can set the output functions to be activated for each "sub"-phase.
The duration of the three start-up phases can be given.

Caution: the 2nd step is in minutes.

10. Service

THESE FUNCTIONS MAY ONLY BE USED BY A WATER TREATMENT TECHNICIAN.
IMPROPOER USE MAY RESULT IN UNDESIRED MALFUNCTIONS.
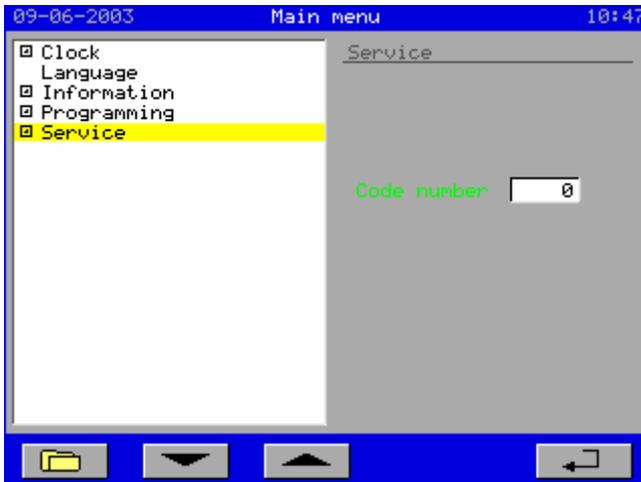
The service menu is protected by a security code. The default factory security code is "4321".
You can change the code under the "*Service – Code number*" option (as described below).

10.1 Security codes
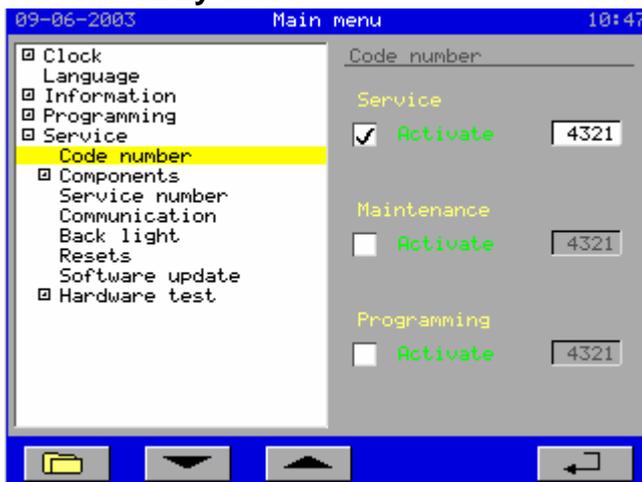
Activate code:
The corresponding security code is activated if the box for "Activate" is "ticked" ☑ .

Change code:
The code can only be changed if it is activated.
Press on the window indicating the code you would like to change.
A numeric input window will appear in which you can change the code.
See § 4.3 "Changing numeric values" on page 11.

The different security codes can be activated here.

Service menu
The security code for the service menu is activated by default and is set to "4321" in the factory. If you would like to bar access to the service menu for unauthorized persons, then you should change this code.

Maintenance
The "Maintenance" phase can also be protected against unauthorized access. If this code is activated, then a numeric input window will appear when the "Maintenance" phase is initiated in which the code must be entered. Maintenance can only be truly initiated if the correct code is given.

Programming
A security code can also be activated for this section to prevent unauthorized persons from changing the settings. If this code is activated, then the "Programming" folder can also be accessed if the correct code is entered in.

CAUTION!: Write down the new codes

10.2   Inventory of connected components
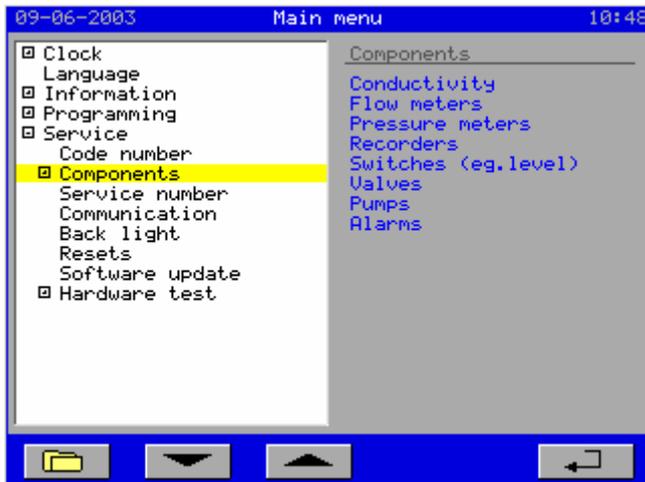
This folder provides a list of all components/functions that can be connected to the controller. The options "*Service – Components – Conductivity*" to "*Service – Components – Alarms*" only need to indicate which components are connected and which ones are not.
This option can make the "*Programming*" option more accessible for the user.
Should there be a component that does not appear in this inventory, then the corresponding settings will not be accessible either. Instead, the following text will appear: "Option not accessible".
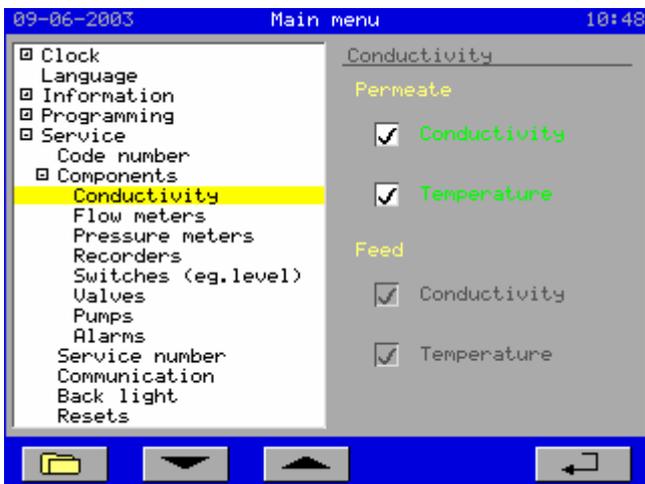
Activate component/function:
The corresponding component is activated if the appropriate box is "ticked" ☑ .

An example for the conductivity meter appears above. In this example, the conductivity meter and temperature meter for the feed line are not accessible because the optional PCB has not been connected. The temperature will also be inaccessible if the conductivity meter has not been connected. The remaining options are similar to the window above.
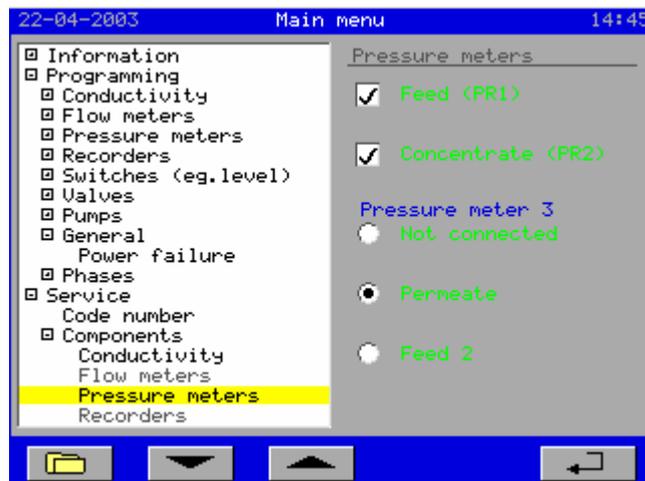
Attention: For pressure meter input 3 (PR3) you can choose if the pressure meter is placed in the permeate line or as a second meter in the feed line.

Caution: The flow meters, pressure meters and recorders are not accessible if the corresponding optional PCB has not been installed (see also § 6.3 "Connected PCBs" on page 13).

Caution: If the booster pump is connected under "*Service – Components – Pump*", then the "Alarm1" alarm function will be cancelled. In this case, this alarm function will also be inaccessible in the "*Service – Components – Alarms*" option.

10.3   Set service phone number
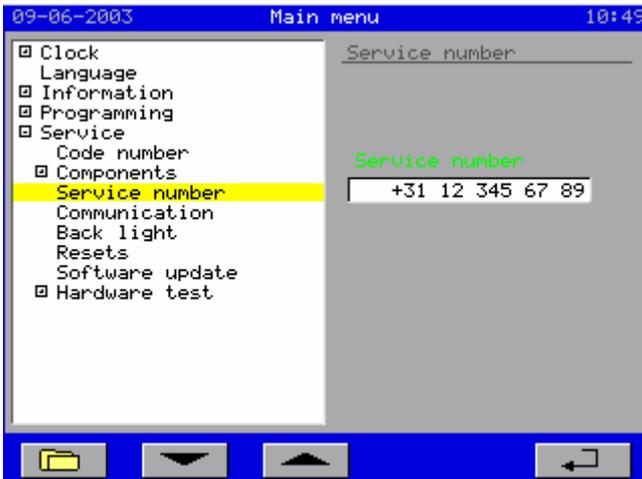
Change phone number:
Press on the window in which the phone number appears.
A numeric input window will appear in which you can change the phone number.

This input window is similar to the numeric input window described in § 4.3 "Changing numeric values" on page 11.

There are, however, a few additional symbols such as: "(", ")", "+" and space.

A service phone number can be entered into this window. The phone number is displayed under the *"Information – General"* option.

10.4   Communication
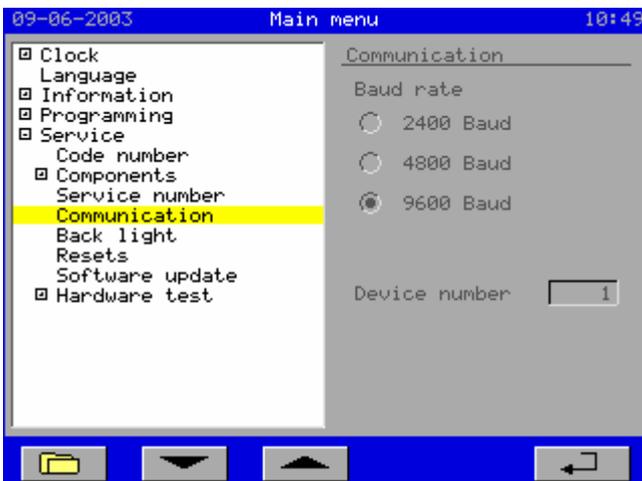
With a special software package (), the controller can be read off from a PC via an RS232 or RS485 connection. At this time, these settings are still fixed.

10.5   Lighting

The LCD display is equipped with background lighting. In this window, you can indicate that the lighting should switch off automatically if the touch panel is not touched during this time and no alarm outputs have been activated.
The lighting will switch back on when the touch panel is touched again.
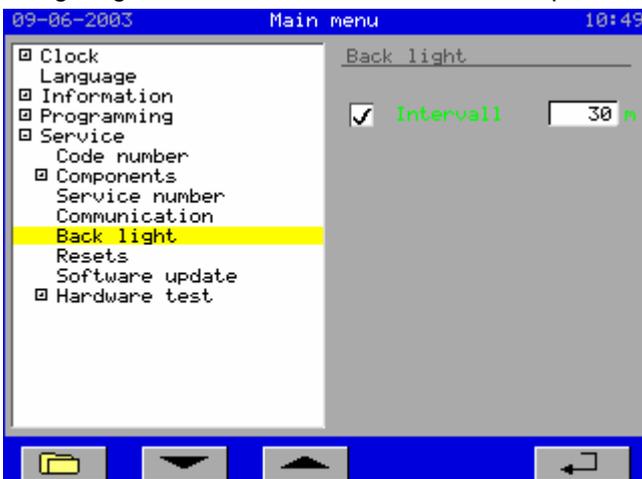
Activate automatic switch off:
Activate the automatic switch off of the background lighting by "ticking" the box ✓.

Change interval time:
The interval time can only be changed if the automatic switch off is activated.
Press on the window indicating the time you would like to change.
A numeric input window will appear in which you can change the code.
See § 4.3 "Changing numeric values" on page 11.

10.6   Resets
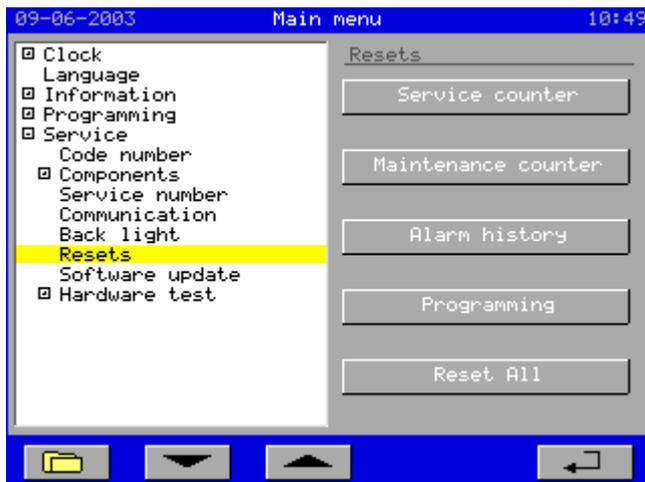
Here, you can reset a number of counters, the programming and the alarm history by pressing the corresponding buttons.

Service hour counter
The total number of service hours is set back to 0.

Maintenance interval counter
The counter that keeps track of when the next maintenance session is due is set back to 0.

Alarm history
The list containing the history of the alarm messages is cleared.

Programming
The programmed settings are set back to the factory default values.

Complete reset
All of the programming, counter statuses and the alarm history are set back to the factory default values.

10.7   Software update
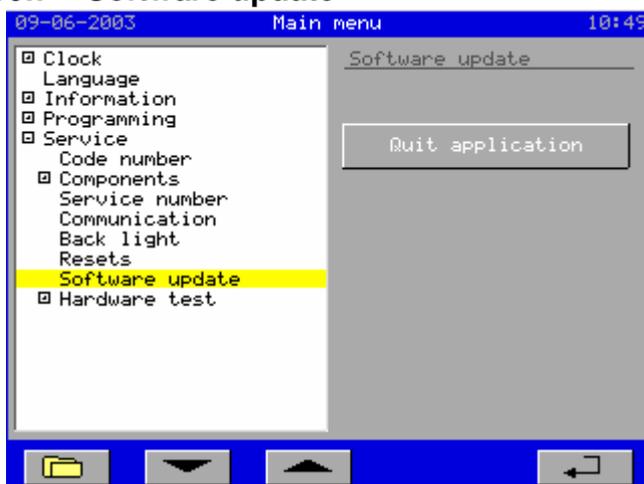
With a Multimedia card (MMC), it is possible to update software to the new version. Pressing the [Quit application] key will stop the RGS7000 application program. The controller will automatically start up in the "boot" software.

In the boot software, you should press the [Load] key to copy the application software from the MMC to the controller. A window will appear indicating the progress of the update.
Once the update is complete, the window will disappear and the new software can be started up by pressing the [Start] key.

10.8 Hardware test
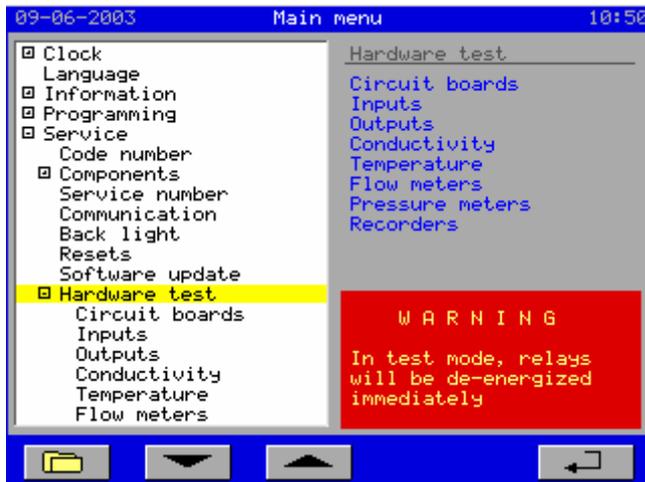
The hardware can be tested in this option. The folder can only be opened if the system is in the "Standby" phase.

Caution: If the test mode is activated (cursor bar on "PCBs"), then all relays will be deactivated!

When the folder is opened, a list of hardware that can be tested will appear.

PCBs
The detected PCBs will appear in this window. The meaning of the indications is described in § 6.3 "Connected PCBs" on page 13.

Inputs
The digital inputs can be tested in this window. After the number of the input, the window indicates whether the input is connected to an open or closed contact.

Closed contact   *Open contact*

Outputs
The relay outputs can be tested in this window. Pressing the [Toggle] key will switch the corresponding relay on (energized) or off (not energized).

Relay not energized   *Relay energized*

Conductivity measurement
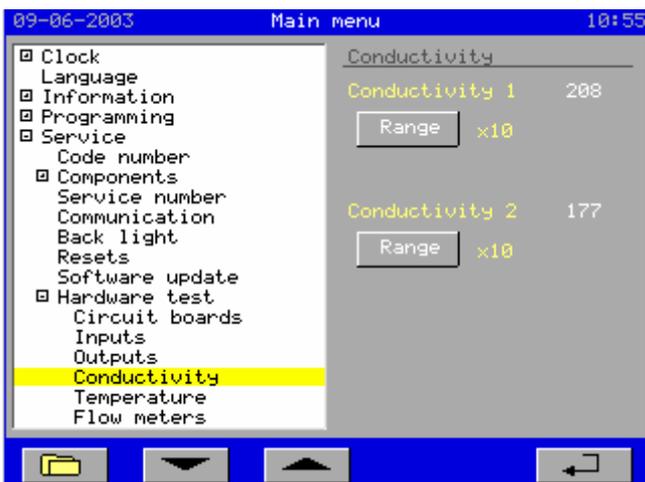
This indicates the measurement value of the conductivity cell. The value indicated is not a µS/cm or ppm value but rather a value that must still be converted to these units by the controller.
Pressing the [Bereik] key will check the internal electronic switch that is responsible for shifting the measurement range.

Temperature
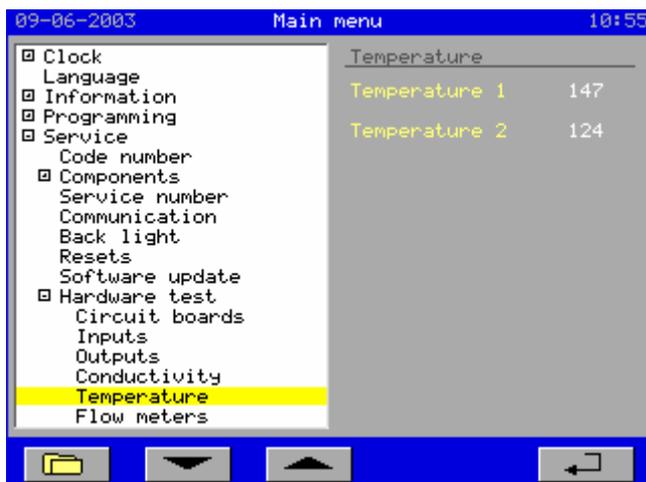
This screen indicates the measurement value of the temperature. The value indicated is not a °C value but rather a value that must still be converted to °C by the controller.

Flow meters
This screen indicates the measurement value of the flow meters. The value indicated is not an l/h value but rather a value that must still be converted to l/h by the controller.
The read out appears in the same format as that of the temperature.

Pressure meters
This screen indicates the measurement value of the pressure meters. The value indicated is not a kPa value but rather a value that must still be converted to kPa by the controller.
The read out appears in the same format as that of the temperature.

Recorders
You can set a current for each output in the recorder output folder.
The settings are only effective if the optional PCB has also been installed (ca-4rec).
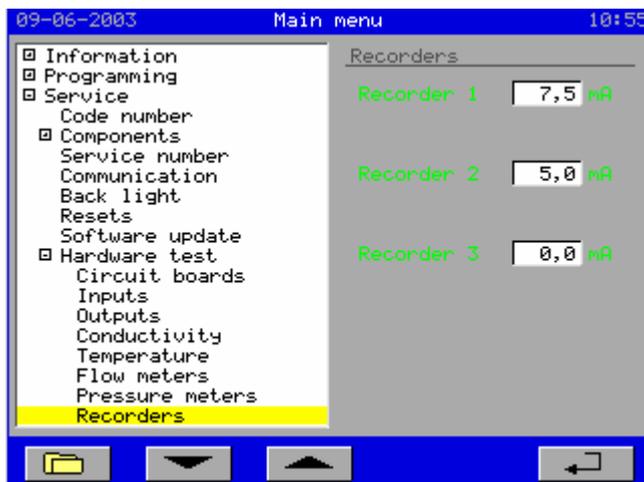
Change current:
Press on the window indicating the current you would like to change.
A numeric input window will appear in which you can change the code.
See § 4.3 "Changing numeric values" on page 11.

11   Possible error messages

Various signals are given off during the production of desalinated water and the rinsing of the system, depending on the options and programming of the controller. These can be indicated with the alarm outputs and in the LCD display.

The alarm outputs are programmable. That means that you can select which messages are sent via the corresponding alarm outputs. These settings can be found with the corresponding switch, measurement value or situation (e.g. power failure).

You can program which alarm outputs will be present in the inventory list of the components as described in § 10.2 "Inventory of connected components " on page 40.

If there is an error message, then this will appear in the LCD display. At the same time, a button will appear in the "alarm" window which may be used to deactivate an output.
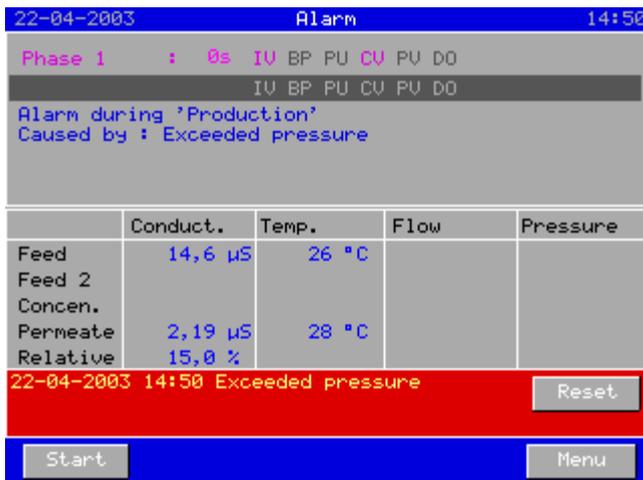
The description of the malfunction is preceded by the date and time at which the malfunction occurred.

The background colour of the "alarm" window will be red if an alarm output was activated.

The LCD display will not be cleared until the message signal is no longer active and the Reset key is pressed again.

However, it is also possible to automatically "reset" the alarm outputs and LCD messages if the cause of the malfunction has been removed.

For each malfunction type, you can program whether an alarm relay and/or LCD message must be activated and, if necessary, automatically reset under the *"Alarm"* option.

In the programming of a particular malfunction, you can indicate whether the system must be switched off and whether the system will switch back on automatically once the malfunction is removed.

For the connected switches, these settings can be found in the *"Properties"* option.

For the connected sensors such as conductivity meters, the settings can be found under the *"Monitoring Min."* and *"Monitoring Max."* options.

Overview of possible alarm messages

11.1   Minimum Conductivity of Permeate
The message "Min.Cond. Permeate" will appear as soon as the measured conductivity in the permeate line drops below the set minimum limit value for a specific period of time.
See § 9.1.1 "Permeate conductivity measurement" on page 19.
Possible causes:
Change in water quality, air in the measuring cell or electrical interruption in the wiring between measuring cell and controller.

11.2   Maximum Conductivity of Permeate
The message "Max.Cond. Permeate" will appear as soon as the measured conductivity in the permeate line exceeds the set maximum limit value for a specific period of time.
See § 9.1.1 "Permeate conductivity measurement" on page 19.
Possible causes:
Change in water quality, defective membrane or short-circuit in the measuring cell.

11.3   Minimum Conductivity of Feed
The message "Min.Cond. Feed" will appear as soon as the measured conductivity in the feed line drops below the set minimum limit value for a specific period of time.
See § 9.1.2 "Feed conductivity measurement" on page 20.
Possible causes:
Change in water quality, air in the measuring cell or electrical interruption in the wiring between measuring cell and controller.

11.4   Maximum Conductivity of Feed
The message "Max.Cond. Feed" will appear as soon as the measured conductivity in the feed line exceeds the set maximum limit value for a specific period of time.
See § 9.1.2 "Feed conductivity measurement" on page 20.
Possible causes:
Change in water quality or short-circuit in the measuring cell.

11.5   Minimum Conductivity %
The message "Min.Cond. %" will appear as soon as the relative conductivity drops below the set minimum limit value for a specific period of time.
See § 9.1.3 "Relative conductivity" on page 21.
Possible causes:
Change in water quality, air in the measuring cell (permeate), electrical interruption in the wiring between measuring cell (permeate) and controller or short-circuit in the measuring cell (feed).

11.6   Maximum Conductivity %
The message "Max.Cond. %" will appear as soon as the relative conductivity exceeds the set maximum limit value for a specific period of time.
See § 9.1.3 "Relative conductivity" on page 21.
Possible causes:
Change in water quality, defective membrane, short-circuit in the measuring cell (permeate), air in the measuring cell (feed) or an electronic interruption in the measuring cell (feed).

11.7   Minimum Temperature of Permeate
The message "Min.Temp. Permeate" will appear as soon as the measured temperature in the permeate line drops below the set minimum limit value for a specific period of time.
See § 9.2 "Temperature measurement" on page 22.

11.8   Maximum Temperature of Permeate
The message "Max.Temp. Permeate" will appear as soon as the measured temperature in the permeate line exceeds the set maximum limit value for a pre-programmed period of time.
See § 9.2 "Temperature measurement" on page 22.

11.9 Faulty Wiring for Temperature of Permeate

The message "Tm.Perm.Not Connected" appears as soon as the measured temperature in the permeate line exceeds 94 °C for a pre-programmed period of time (as set for maximum temperature monitoring, see § 9.1.1 "Permeate conductivity measurement" on page 19). The controller considers this to be faulty wiring in the connected temperature sensor.

11.10 Minimum Temperature of Feed

The message "Min.Temp. Feed" will appear as soon as the measured temperature in the feed line drops below the set minimum limit value for a pre-programmed period of time.
See § 9.2 "Temperature measurement" on page 22.

11.11 Maximum Temperature of Feed

The message "Max.Temp. Feed" will appear as soon as the measured temperature in the feed line exceeds the set maximum limit value for a pre-programmed period of time.
See § 9.2 "Temperature measurement" on page 22.

11.12 Faulty Wiring for Temperature of Feed

The message "Tm.Feed.Not Connected" appears as soon as the measured temperature in the feed line exceeds 94 °C for a pre-programmed period of time (as set for maximum temperature monitoring, see § 9.1.2 "Feed conductivity measurement" on page 20). The controller considers this to be faulty wiring in the connected temperature sensor.

11.13 Stop signal

The "Stop signal" appears as soon as the "Stop" input has been activated for a specific period of time.
See § 9.6.1 "Stop" on page 29.

11.14 Exceeded Pressure

The message "Exceeded pressure" appears as soon as the "Exceeded pressure" input has been activated for a specific period of time. See § 9.6.4 "Exceeded pressure" on page 31.

11.15 Low water pressure

The message "Low water pressure" appears as soon as the "Low water pressure" input is activated after the pre-programmed number of attempts. The counter for the number of restarts will only be reset when the input has not been activated for a pre-programmed delay time + 1 second, when the high pressure pump or booster pump are switched on.
See also § 9.6.5 "Low water pressure" on page 31.

11.16 Concentrate

The message "Concentrate" appears as soon as the "Concentrate" input is activated again after the pre-programmed number of attempts. The counter for the number of restarts will only be reset when the input has not been activated for a pre-programmed delay time + 1 second, when the high pressure pump or booster pump are switched on. See also § 9.6.6 "Concentrate" on page 32

11.17 Motor security

The message "Motor security" appears as soon as the "Motor security" input has been activated for a specific period of time. See § 9.6.7 "Motor security" on page 32.

11.18 Minimum Flow of Feed

The message "Min.Flow Feed" will appear as soon as the flow in the feed line drops below the set minimum limit value for a pre-programmed period of time.
See § 9.3.1 "Feed flow measurement" on page 23.

11.19 Maximum Flow of Feed

The message "Max.Flow Feed" will appear as soon as the flow in the feed line exceeds the set maximum limit value for a pre-programmed period of time.
See § 9.3.1 "Feed flow measurement" on page 23.

11.20 Minimum Flow of Concentrate

The message "Min.Flow Concentrate" will appear as soon as the flow in the concentrate line drops below the set minimum limit value for a pre-programmed period of time.
See § 9.3.2 "Concentrate flow measurement" on page 24.

11.21 Maximum Flow of Concentrate

The message "Max.Flow Concentrate" will appear as soon as the flow in the concentrate line exceeds the set maximum limit value for a pre-programmed period of time.
See § 9.3.2 "Concentrate flow measurement" on page 24.

11.22 Minimum Flow of Permeate

The message "Min.Flow Permate" will appear as soon as the flow in the permate line drops below the set minimum limit value for a pre-programmed period of time.
See § 9.3.3 "Permeate flow measurement" on page 24.

11.23 Maximum Flow of Permeate

The message "Max.Flow Permate" will appear as soon as the flow in the permate line exceeds the set maximum limit value for a pre-programmed period of time.
See § 9.3.3 "Permeate flow measurement" on page 24.

11.24 Minimum Pressure of Feed

The message "Min.Pres. Feed" will appear as soon as the measured pressure in the feed line drops below the set minimum limit value for a pre-programmed period of time.
See § 9.4.1 "Feed pressure measurement" on page 25.

11.25 Maximum Pressure of Feed

The message "Max.Pres. Feed" will appear as soon as the measured pressure in the feed line exceeds the set maximum limit value for a pre-programmed period of time.
See § 9.4.1 "Feed pressure measurement" on page 25.

11.26 Minimum Pressure of Concentrate

The message "Min.Pres. Concentrate" will appear as soon as the measured pressure in the concentrate line drops below the set minimum limit value for a pre-programmed period of time.
See § 9.4.2 "Concentrate pressure measurement" on page 26.

11.27 Maximum Pressure of Concentrate

The message "Max.Pres. Concentrate" will appear as soon as the measured pressure in the concentrate line exceeds the set maximum limit value for a pre-programmed period of time.
See § 9.4.2 "Concentrate pressure measurement" on page 26.

11.28 Minimum Pressure of Permeate

The message "Min.Pres. Permeate" will appear as soon as the measured pressure in the permeate line drops below the set minimum limit value for a pre-programmed period of time.
See § 9.4.3 "Permeate pressure measurement" on page 26.

11.29 Maximum Pressure of Permeate

The message "Max.Pres. Permate" will appear as soon as the measured pressure in the permeate line exceeds the set maximum limit value for a pre-programmed period of time.
See § 9.4.3 "Permeate pressure measurement" on page 26.

11.30 Power failure

The message "Power Failure" will appear as soon as the controller is switched back on and the display of this message is activated.
See § 9.9.1 "Power failure" on page 34.

11.31 Maintenance

The message "Maintenance" will appear as soon as the maintenance interval counter is activated and the display of this message is activated.
See § 9.10.5 ""Maintenance" phase" on page 38.

12 . FAQ

Question:
The screen is off

> ***Answer:***
> - The screen lighting can be programmed to switch off after a certain period of time. (§ 10.5 "Lighting" on page 41).
>   The lighting will switch back on when the screen is touched again.

> ***Answer:***
> - The lighting is defective.

Question:
The flow measurement is not being checked.

> ***Answer:***
> - If the indications show that flow meters are connected (§ 10.2 "Inventory of connected components " on page 40), then the monitoring must be switched on (§ 9.3 "Flow measurement" on page 23).
>   Also, the flow monitoring can be set for each process. Therefore, this must also be switched on (e.g. § 9.10.1 ""Production" phase" on page 35).

13 Menu Overview
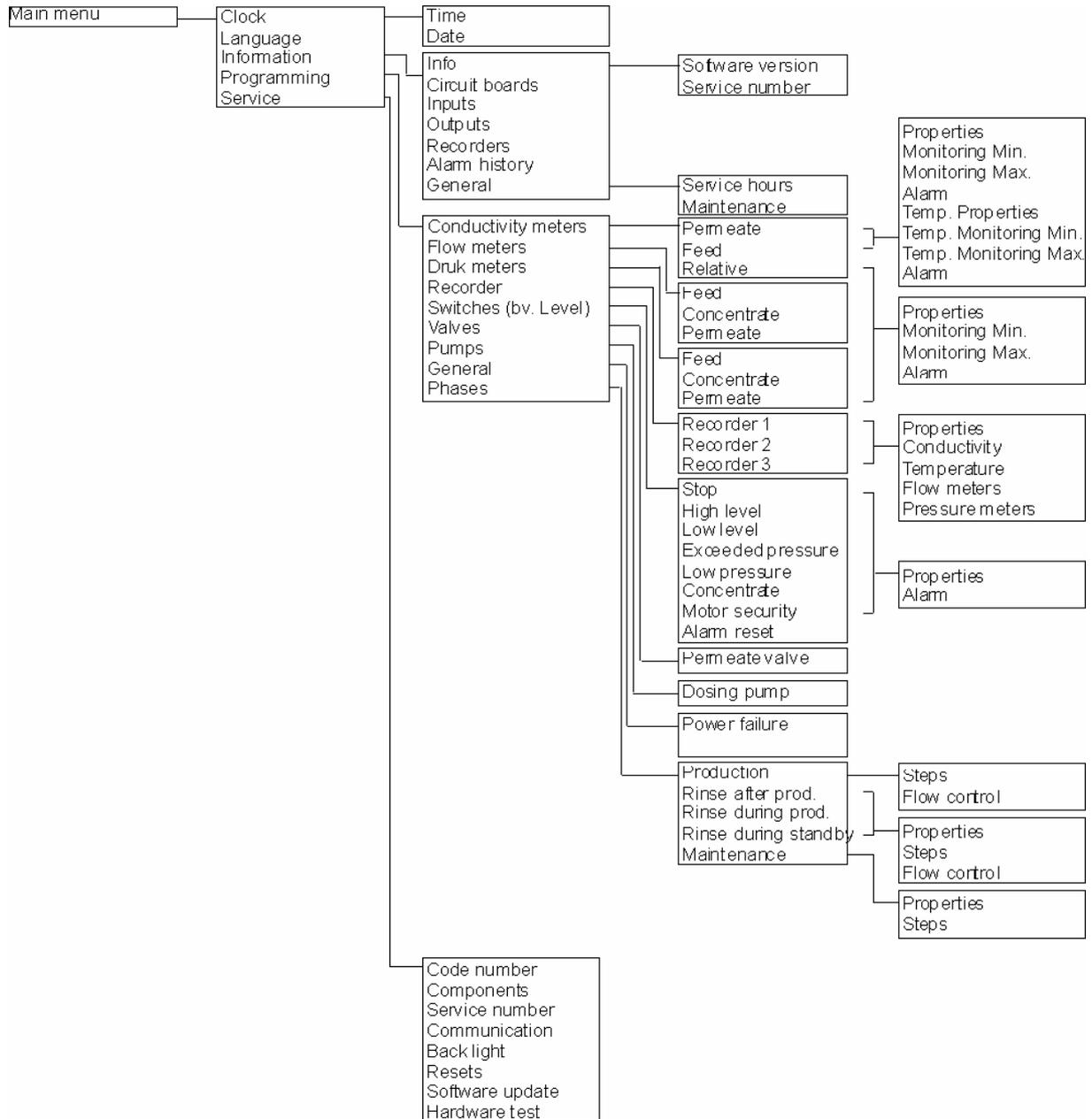
14 . Opening the housing

Remove the four side covers of the housing.
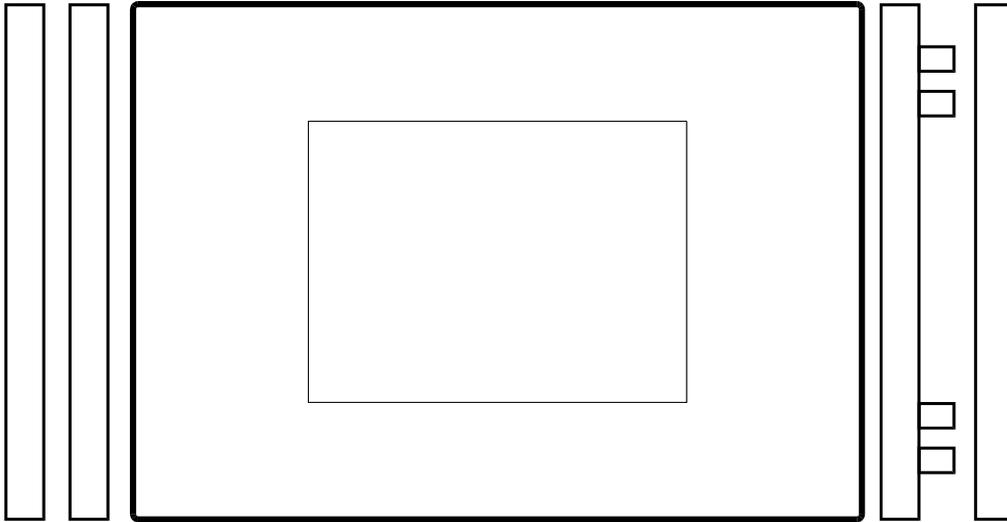
Open the housing on the left side by carefully placing the key cover between the hinge points and pushing until the front door springs open.

15 . RGS7000 Terminal Block

Label	Description
RC3	Recorder output 3
RC2	Recorder output 2
RC1	Recorder output 1
PR3	Pressure meter (permeate)
PR2	Pressure meter (concentrate)
PR1	Pressure meter (feed)
FL3	Flow meter (permeate)
FL2	Flow meter (concentrate)
FL1	Flow meter (feed)
TC2	Temperature probe (feed)
CC2	Conductivity probe (feed)
—	Multi media card
Rx	RS232 (RS485)
Tx	RS232 (RS485)
TC1	Temperature probe (permeate)
CC1	Conductivity probe (permeate)
RS	Alarm reset
PS	Motor safetyguard switch
CC	Concentrate flow switch
LP	Low pressure switch
HP	Overpressure switch
LL	Tank empty
LH	Tank full
ST	Stop
AL2	Alarm
AL1	Alarm / Booster pump
DO	Dosing pump
PV	Permeate valve
CV	Concentrate valve
PU	High pressure pump (three phase adapter)
IV	Inlet valve
	Power output
	Power supply
	Protective earth

See next page for glossary of abbreviations.

15.1   Glossary of abbreviations

Outputs

IV	Inlet shut-off valve.
PU	High pressure pump.
CV	Concentrate shut-off valve.
PV	Permeate rinse valve.
DO	Dosing pump.
BP	Booster pump.
AL1	Alarm signal 1.
AL2	Alarm signal 2.

Inputs

ST	Stop.
LH	High level switch.
LL	Low level switch.
EP	Exceeded pressure
LP	Low pre-pressure.
CO	Concentrate.
PS	Motor security switch.
RS	Alarm reset.

Measurements

CC1	Conductivity meter for permeate.
CC2	Conductivity meter for feed.
TC1	Temperature sensor for permeate.
TC2	Temperature sensor for feed.
FL1	Flow meter for feed
FL2	Flow meter for concentrate
FL3	Flow meter for permeate
PR1	Pressure meter for feed
PR2	Pressure meter for concentrate
PR3	Pressure meter for permeate

Recorder

RC1	Recorder 1
RC2	Recorder 2
RC3	Recorder 3

Storage

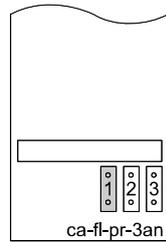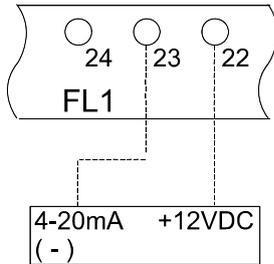|	
MMC	Multimedia card

Communication

Tx	Transmission line for serial connection
Rx	Reception line for serial connection

16 . Electrical connection examples

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

Connection of flow meter (2 wires)

Connection of a 2-wire flow meter with a 4 – 20mA output to input FL1 (feed).
A "jumper" should be placed on the "ca-fl-pr-3an" PCB as shown in the illustration.

Jumpers "2" and "3" should be installed for FL2 and FL3, respectively.

RS232 Connection
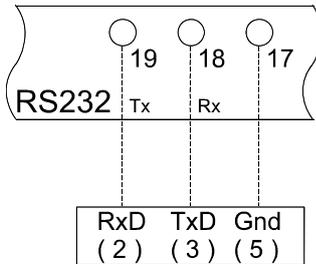
Connector type DB9
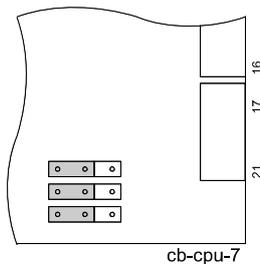
To set the communication port of the controller to "RS232", the jumpers should be installed (cpu PCB cb-cpu-7) according to the illustration shown on the left.

RS485 Connection

To set the communication port of the controller to "RS485", the jumpers should be installed (cpu PCB cb-cpu-7) according to the illustration shown on the left.

17 . Instructions for Installation and Start up

17.1 General Information

- 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 electric company as well as any manufacturer specifications.
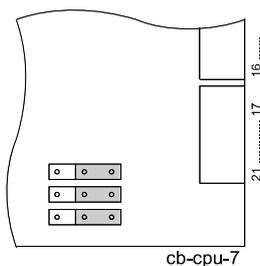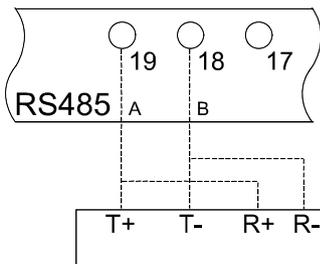
- Ensure that the connection to earth is flawless.

- Separate all wiring carrying low voltage (inputs and measurements) from supply cables.

- Switch on the device and perform basic programming using this manual and the technical information from the supplier.

- Set the current time

- Start up the system according to manufacturer's specifications.

- Change the security code to your own code and <u>write down the new code</u>. (§ 10.1 "Security codes" on page 39.)

CAUTION:
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.
Consult the supplier of these components for the proper type of RC network.

17.2 Installation
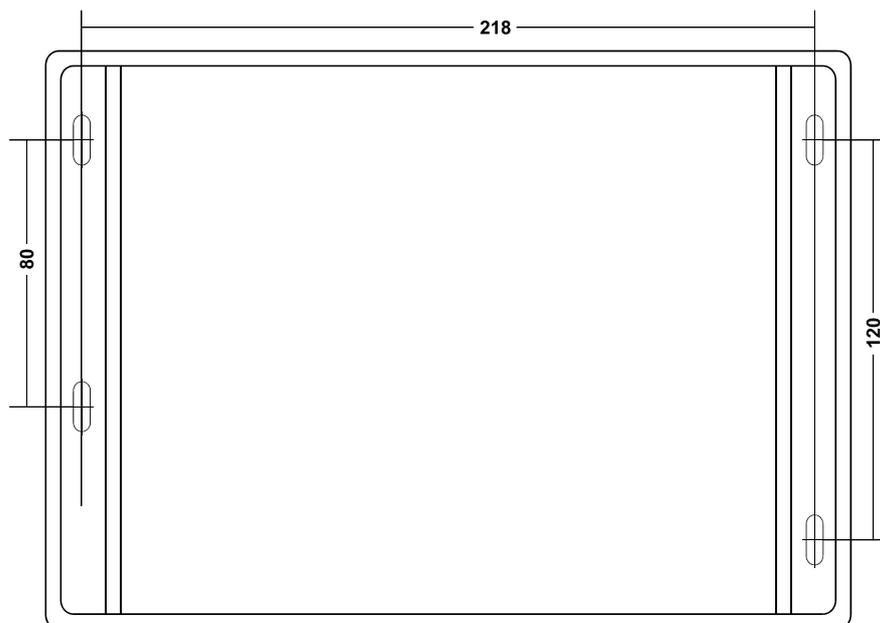
18 . Maintenance

The controller does not require any special maintenance.

LCD display
If the "touch panel" is operated with dirty fingers, it may happen that the LCD becomes difficult to read.
Should this occur the LCD display can be cleaned with a moist cloth.

Caution: Do not use chemical cleaning products for this, only water!

19 . Installation of optional PCBs

A number of expansions are possible for the standard RGS7000-type controller.
These optional PCBs should be installed on the basic measurement PCB.
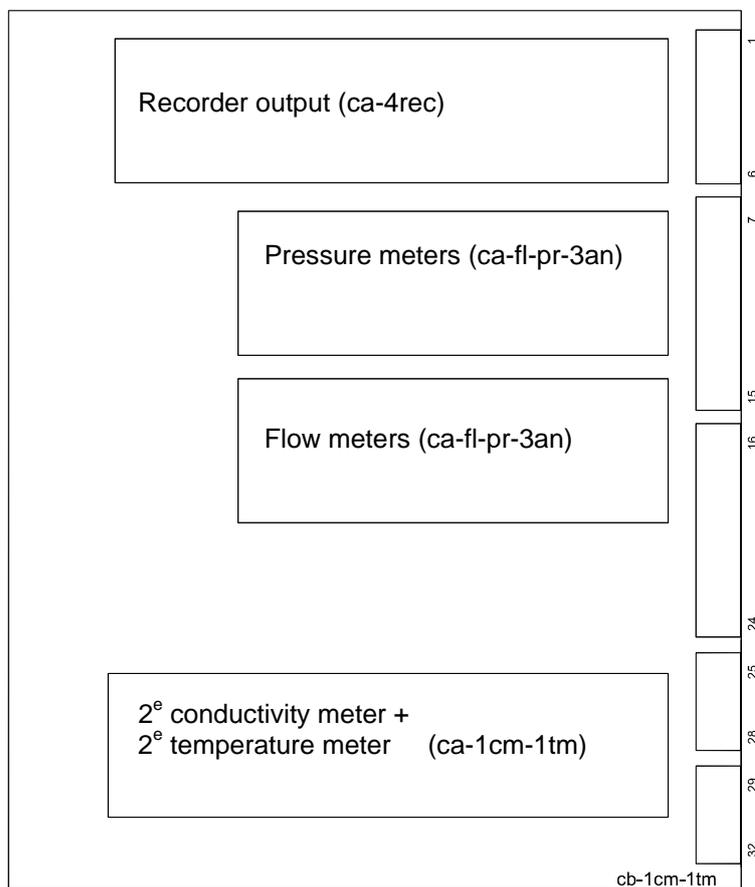
20 . Spare parts

20.1   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	

20.2   Pictures

EH-A

EH-C-N

EH-C-K

EH-U-S

21 . Technical Specifications

$C\epsilon$

Power Supply:	24V	+ 10% 50-60 Hz main fuse 1AT
	115V	+ 10% 50-60 Hz main fuse 315mAT
	230V	+ 10% 50-60 Hz main fuse 160mAT
	115/24V	+ 10% 50-60 Hz main fuse 1AT
	230/24V	+ 10% 50-60 Hz main fuse 1AT
	240/24V	+ 10% 50-60 Hz main fuse 1AT

Fuse for outputs 4AT

Power consumption: 11VA

Outputs under voltage: Total load up to 4A at 115/24V, 230/24V and 240/24V. And total load up to 4A at 24V/24V, 115V/115V, 230V/230V

Potential-free outputs   load max. 250V, 4A

Outputs (0-20mA):   12V

Inputs (digital):   load at 12V, 18 mA

Inputs (0-20mA):   12V

Protection class: IP65

Ambient temperature: 0 – 50 °C

Weight: approx. 3.0 kg   for 24/24V, 115/115V and 230/230V models
     approx. 3.6 kg   for 115/24V, 230/24V and 240/24V models

Dimensions: Total   : W x H x L = 252 x 186 x 146 mm
     Installation
     - depth   : 122m
     - panel opening : 240 mm x 174 mm

Special notes: Specifications remain unchanged during power failure.

21.1 Housing dimensions
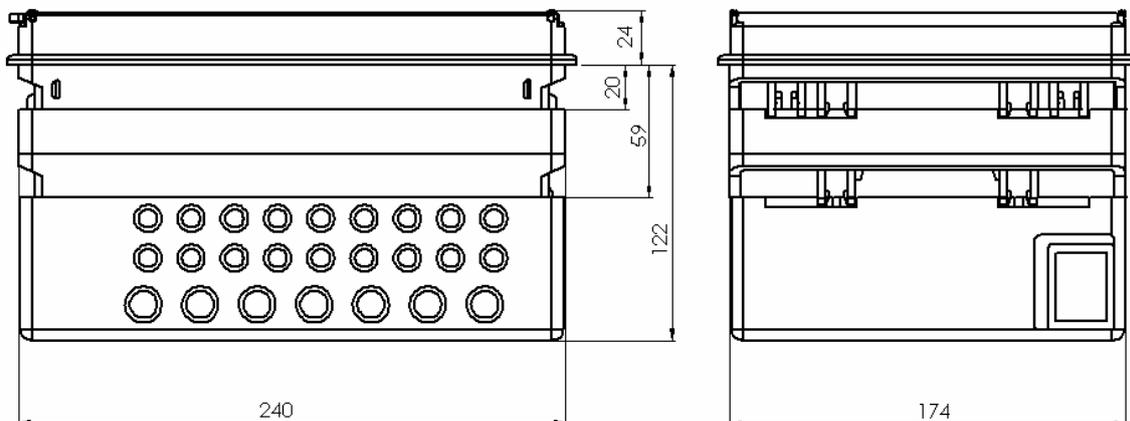
22 . Declaration of conformity

Declaration of conformity of the product with the essential requirements of EMC directive 89/336/EEC.

Product description

Product name	: Controller for reverse osmosis installation
Product type	: RGS7000
Manufacturer	: EWS Equipment for Water treatment Systems International B.V.

Product environment

This product is intended for use in residential and light industrial environments.

Emission standard	: EN 50081-1
Immunity standard	: EN 61000-6-1

Report

Report number	: EWS/EMC/0411

This declaration was issued by:

Date	: 26-11-2004
Name	: D.H. Naeber
Signature	:

FIVE-YEAR CONTROLLER LIMITED WARRANTY

LIMITED WARRANTY
EWS International (hereafter EWS) warrants her products free from defects in material and workmanship under the following terms.
In this warranty, "Products" shall be taken to mean all devices that are supplied pursuant to the contract with exception of software.

VALIDITY OF THE WARRANTY
Labour and parts are warranted for five years from the date of the first customer purchase. This warranty is only valid for the first purchase customer.

Notwithstanding the warranty period of five years as mentioned above - while upholding the remaining provisions – a warranty period of three months applies to the supply of software.

COVER OF THE WARRANTY
Subject to the exceptions as laid down below, this warranty covers all defects in material or workmanship in the EWS products. The following are not covered by the warranty:

1) Any product or part not manufactured nor distributed by EWS. EWS will pass on warranty given by the actual manufacturer of products or parts that EWS uses in the product.
2) Any product, on which the serial number has been defaced, modified or removed.
3) Damage, deterioration or malfunction resulting from:
    a) Accident, misuse, neglect, fire, water, lightning or other acts of nature.
    b) Product modification or failure to follow instructions supplied by the products.
    c) Repair or attempted repair by anyone not authorized by EWS.
    d) Any shipment of the product (claims must be presented to the carrier)
    e) Removal or installation of the product
    f) Any other cause, which does not relate to a product defect.
    g) Cartons, equipment enclosures, cables or accessories uses in conjunction with the product.

FINANCIAL CONSEQUENTES
EWS will only pay for labour and material expenses for covered items, proceed from repairs and updates done by EWS at the EWS location. EWS will not pay for the following:
1) Removal or installations charges at customers and/or end user location.
2) Costs for initial technical adjustments (set-up), including adjustment of user controls or programming.
3) Shipping charges proceed from returning goods by the customer. (Shipping charges for returning goods to the customer are for the account of EWS).

All the costs which exceed the obligations of EWS under this Warranty, such as, but not limited to, travel and accommodation costs and costs for assembly and dismantling are for the account and risk of the customer.

WARRANTY SERVICE
In order to retain the right to have a defect remedied under this warranty, the customer is obliged to:
1) Submit complaints about immediately obvious errors related to the products delivered, in writing within eight days of the delivery of the products and submit complaints about shortcomings relating to the products delivered, which are not visible, within eight days of their being discovered.
2) Return defected products for account and risk of the customer. Costs for this shipment will not be reimbursed by EWS. The products may only be returned following express, written permission from EWS. Returning the products does not affect the obligation to pay the invoiced amounts.

3) Present the original dated invoice (or a copy) as proof of warranty coverage, which must be included in any [of the] return shipment of the product. Please include also in any mailing a contact name, company, address and a description of the problem(s).

LIMITATION OF IMPLIED WARRANTIES
Except where such disclaimers and exclusions are specifically prohibited by applicable law, the foregoing sets forth the only warranty applicable to the product, and such warranty is given expressly and in lieu of all other warranties, express or implied, or merchantability and fitness for a particular purpose and all such implied warranties which exceed or differ from the warranty set forth herein are hereby disclaimed by EWS.

EXCLUSION OF DAMAGES
EWS' liability for any defective products is limited to the repair or replacement of the product at our option. Except where such limitations and exclusions are specifically prohibited by applicable law EWS shall not be liable for:
1) Damage to other property caused by defects in the EWS product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss or:
2) Any damages, whether incidental, [consequential or otherwise] special, indirect or consequential damages, injury to persons or property, or any other loss.

Under no circumstances whatsoever shall EWS be obliged to provide compensation beyond the direct damage incurred by customer up to an amount not exceeding the payment receivable from the insurer of EWS in connection with the damage.

APPLICABLE LAW AND DISPUTES
1) Dutch law shall govern all offers made by EWS and all agreements concluded between EWS and customer. This warranty explicitly excludes application of the Vienna Sales Convention (CISG).
2) All disputes which may arise between the parties shall be dealt with exclusively by the competent court of law in the Netherlands under whose jurisdiction EWS falls. However, EWS reserves the right to submit any disputes to the competent court in the customer's location.