
INDUSTRIAL

WATER EQUIPMENT

Instruction manual for reverse osmosis plants



Instruction manual

Software versie 2.00

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General description

The OS3020 operating control is used to fully automatically monitor and control very simple water treatment systems, which operate according to the reverse osmosis principle.

The basic values that have been programmed into the operating control can be changed at any moment and are not erased in case of a power failure.

The control has four switching steps, namely "PRODUCTION", "STAND-BY", "RINSE" and "INTERVAL RINSE".

"Production" step

The start of the production depends on the number of programmed level switches and the position of these switches (inputs FU and EM).

In the "Production" step of the reverse osmosis system first the inlet valve is opened. After an adjustable delay time of 1 - 999 seconds the high-pressure pump is activated.

The following values are monitored:

- Conductivity below the minimum limit value
- Conductivity above the maximum limit value
- Low water pressure input
- Exceeded pressure input
- Tank high-level input
- Tank low-level input
- Stop

A built-in working hours counter registers the duration of the "PRODUCTION" step from one minute to 65.000 hours.

"Stand by" step

No water flows during the "Stand by" step. The input valve is closed and the high-pressure pump is switched off.

The following values are monitored:

- Tank high-level input
- Tank low-level input

"Rinse" step

The step "Rinse" will be activated (if programmed in step 10.1) after finishing the step "Production".

The concentrate valve will be opened always. The inlet valve and high pressure pump can be programmed. The high pressure pump can be switched on with a programmable delay.

The following values are monitored:

- Low water pressure input (only when inlet valve is opened)
- Exceeded pressure input
- Tank high-level input
- Tank low-level input
- Stop

"Interval Rinse" step

The step "Interval Rinse" will be activated (if programmed in step 11.1) when there is no water production for a programmable time.

The concentrate valve will be opened always. The inlet valve and high pressure pump can be programmed. The high pressure pump can be switched on with a programmable delay.

The following values are monitored:

- Low water pressure input (only when inlet valve is opened)
- Exceeded pressure input
- Tank high-level input
- Tank low-level input
- Stop

Measuring and function display

First LCD line

The first line of the LCD display shows the actual phase of the system: "Production", "Stand-by", "Rinse" and "Int.Rinse".

If the system has been switched off on account of an alarm situation during one of the above phases, then this is indicated by the additional text "Alarm" (eg "Rinse Alarm").

Second LCD line

Depending on the current phase of the system, the second line of the LCD display shows measuring and operating values.

ATTENTION! If for a measuring value in the second line the message "OFL" appears, then the value to be measured lies outside the measuring range.

Second LCD line for the "Production" step

Production	
Delay	10s

The second line of the LCD display shows the following information during the "Production" step:

At the beginning, the delay time is displayed in seconds, until the high-pressure pump is enabled, for instance "Delay 10s".

Also the value of conductivity 1 and the production hours are displayed alternately.

Conductivity	8.0 $\mu\text{S}/\text{cm}$
Service	114:14 (hours:minutes)

Second LCD line for the "Standby" step

Standby
Service 114:14

The second line of the LCD display shows the following information during the "Standby" step:

Also the value of conductivity 1 and the working hours are displayed.

Conductivity	8.0 μ S/cm
Service	114:14 (hours:minutes)

Second LCD line for the "Rinse" step

Rinse
Rinsetime 10s

The second line of the LCD display shows the following information during the "Rinse" step:

At the beginning, the delay time is displayed in seconds, until the high-pressure pump is enabled, for instance "Delay 10s".

During the rinse, the remaining rinse time will be displayed.

Also the value of conductivity 1 and the production hours are displayed alternately.

Conductivity	8.0 μ S/cm
Service	114:14 (hours:minutes)

Second LCD line for the "Interval rinse" step

Int.Rinse
Rinsetime 10s

The second line of the LCD display shows the following information during the "Interval Rinse" step:

At the beginning, the delay time is displayed in seconds, until the high-pressure pump is enabled, for instance "Delay 10s".

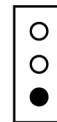
During the rinse, the remaining rinse time will be displayed.

Also the value of conductivity 1 and the production hours are displayed alternately.

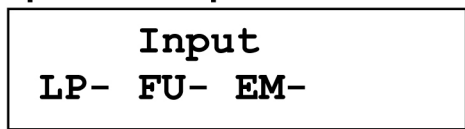
Conductivity	8.0 $\mu\text{S}/\text{cm}$
Service	114:14 (hours:minutes)

Info display

The information key can be used to retrieve various information. When you press the information key, the first information is displayed. You can obtain further information by pressing the key again.



Input switch positions



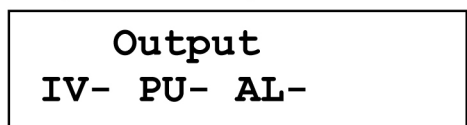
Here the current switch positions of the input functions are displayed.

LP = low water pressure FU = high-level switch

EP = exceeded pressure EM = low-level switch

ST = stop

Output switch positions



Here the current switch positions for the IV, PU and AL / CV outputs are displayed.

IV = Inlet valve

PU = High pressure pump

AL = Alarm

CV = Concentrate valve

Software version

Software version	
OS3020	1.04.00

The factory regularly updates the software. Changes are made as necessary to adapt the product to the latest insights and requirements. Displayed is the number of the built-in version.

Alarms

Here you will find an overview of the alarm messages that can appear in the display. When a service number is programmed (step 9.3 and 9.4) then the right display will appear otherwise the left display will appear.

CD MIN

**Limit CM Min
under valued**

**CM to low
0031 73 443755**

The conductivity value on the conductivity meter has fallen below the set minimum limit value. The system remains switched on. The message disappears as soon as the minimum limit value is again exceeded. The alarm relay can be activated.

CD MAX

**Limit CD Max
exceeded**

**CM to high
0031 73 443755**

The conductivity value on the conductivity meter has exceeded the set maximum limit value. The system remains switched on. The message disappears as soon as the maximum limit value again falls below the set limit value. The alarm relay can be activated.

CM Max exceeded	19s	CM to high 0031 73 443755	19s
----------------------------------	------------	--	------------

This message will appear when the plant has to be switch off when the conductivity is too high. In the right upper corner the remaining time will be shown until the plant will be stopped. When the conductivity is correct within this time the plant will not be stopped and the message will disappear automatically.

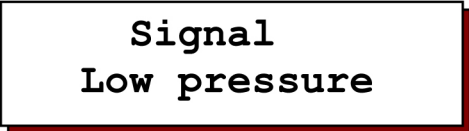
Stop CM Max	CM to high STOP 0031 73 443755
------------------------------	---

When the plant is stopped you will find this message in the display. The plant can be start again by switching off and on again the controller.

Exceeded pressure

Signal Overpressure

The "excess pressure" input has been activated. The system is switched off and automatically switched on again after a programmed delay time.
Possible cause: set value for the system was changed, soiled membrane.

Low water pressureA rectangular box with a black border and a red shadow. Inside, the text "Signal" is on the top line and "Low pressure" is on the bottom line, both in a bold, black, serif font.


Signal
Low pressure

The "Low pre-pressure" input has been activated.

The system is switched off and automatically switched on again after a programmed delay time.

The message disappears as soon as the "low pre-pressure" signal has been cancelled.

Possible cause: no water pressure

StopA rectangular box with a black border and a red shadow. Inside, the text "Signal" is on the top line and "Stop" is on the bottom line, both in a bold, black, serif font.

Signal
Stop

The "Stop" input has been activated.

The system is switched off and switched on again when the signal at the input has been cancelled.

The message disappears as soon as the "low pre-pressure" signal is cancelled.

Input functions

The 'Low water pressure' (LP) and 'Tank full' (FU) inputs are standard available.

The third IN input depends on the programming :

- 'Tank empty' for two level switches
- 'Exceeded pressure' for one level switch
- 'Stop' for one level switch

Low water pressure

The 'Low water pressure' (LP) input is used to prevent the pump from running dry.

In step 6.1 you can program the delay before the system is switched off. The LCD display shows the message 'Low water pressure' and in step 7.1 you can set whether the alarm relay must be activated for this message.

The system switches on again automatically after the delay programmed in step 6.3.

The input function is active when the contact is open.

Tank full / Tank empty

The input functions 'Tank full' (FU) and 'Tank empty' (EM) are used for automatically filling a storage tank.

In step 5.1 you can select whether one or two level switches are used.

If you only use one level switch, then the 'IN' input is used for excess pressure safety.

Replenishing takes place after a programmable delay.

You can program if the level switch inputs are activated on open or close contact.

Exceeded pressure

The 'Exceeded pressure' (EP) input function can only be used if only one level switch is used.

In step 6.2 you can program the delay before the system is switched off. The LCD display shows the message 'Exceeded pressure' and in step 7.1 you can set whether the alarm relay must be activated for this message.

The system switches on again automatically after the delay programmed in step 6.3.

Stop

The 'Stop' (ST) input function can only be used if only one level switch is used.

In step 6.3 you can program the delay before the system is switched off. The LCD display shows the message 'Stop' and in step 7.1 you can set whether the alarm relay must be activated for this message.

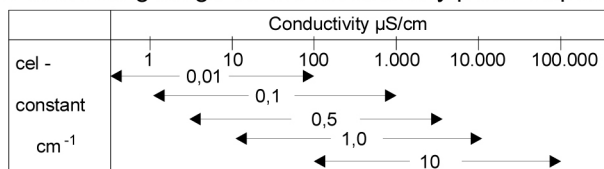
In step 6.6 you can program whether the function is activated when the contact is closed or opened.

The system switches on again automatically when the input is no longer active.

Conductivity probe

The connection for the conductivity probe is indicated by 'CC'.

The measuring range for the conductivity probe depends on the cell constant.

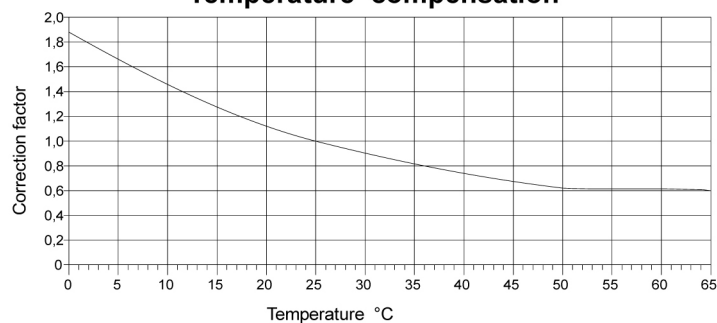


The cell constant must be programmed in step 2.1. You can also set the minimum and maximum limit value with a programmable delay time.

In step 7.1 you can set whether the alarm relay must be activated for the message.

You can compensate the conductivity measurement for temperature. The water temperature must be programmed in step 3.

Temperature compensation



Example:

Set, respectively measured water temperature:

$T = 11\text{ }^{\circ}\text{C}$

Measured conductivity values:

$C_{11} = 100\text{ }\mu\text{S}/\text{cm}$

Applied correction factor:

$K = 1,4$

Displayed conductivity value:

$C_{25} = 140\text{ }\mu\text{S}/\text{cm}$

Output functions

The output functions 'Inlet valve' (IV) and 'High-pressure pump' (PU) are standard available.

The output functions 'Alarm' (AL) and 'Concentrate valve' (CV) can be selected for the third relay output (terminals 9,10 and 11).

Inlet valve

The input valve is opened as soon as the 'Production' step, "Rinse" step (if programmed) or "Int.Rinse" step (if programmed) is activated.

The maximum current load on this output is 8A (fused).

High-pressure pump

The high-pressure pump is activated after the input valve has been opened with a delay time programmed in step 8.1.

The maximum current load on this output is 8A (fused).

Alarm

The alarm relay can be activated for certain events like:

- minimum conductivity value exceeded
- maximum conductivity value exceeded
- low water pressure
- exceeded pressure
- stop

You can program whether or not the alarm relay must be energised in case of malfunction.

Concentrate valve

The concentrate valve is only opened during the rinse functions.

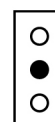
Display and modification of set points

When the system is put into operation, the operational data of the reverse osmosis system can be controlled by entering basic values.

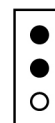
You can change these values at any time and they are not erased in case of a power failure.

To prevent unwanted changes in the programme, you must keep the key depressed for four seconds before the system allows you to make changes

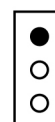
With the same key you can then browse through the programming.



You leave the programming mode automatically about two minutes after the last keystroke or by pressing the key combination as shown.

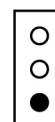


With the upper key you can move the cursor.



By pressing the lower key you can change numeric values within the given range that you have first marked with the cursor.

For questions with a choice, you can also use this key to switch between '-' en '|'.



1. Language

Step no.:	1.1
D	N1 <u>E</u> F

In this step you can set the language.

2. Conductivity meter

Step no.:	2.1
Constant	0,10 <u>0</u>

You must select a measuring cell with an adjusted cell constant in accordance with the conductivity of the water. Here you can program a cell constant between 0.01 and 10.00 cm⁻¹ for the conductivity meter.

Step no.:	2.2
Value Min	1,0 <u>0</u>

An electrical interruption of the measuring cell, electrical errors in the system or air in the measuring cell can produce a seemingly very low conductivity. For monitoring purposes you can enter a limit value between 0.0 and 999 µS/cm.

Step no.:	2.3
Delay	6<u>0</u>s

If after a programmed delay time between 1 and 9999 seconds the lower limit of the limit value is exceeded the LCD display shows the error message 'Limit CD Min below limit value'.

Step no.:	2.4
Value Max	100,<u>0</u>

A change in the quality of the water supply may change the water conductivity. For monitoring purposes you can enter a limit value between 0.2 and 6500.0 $\mu\text{S/cm}$.

Step no.:	2.5
Delay	180<u>0</u>s

If after a programmed delay time between 1 and 9999 seconds the value of the upper limit is exceeded, the LCD display shows the error message 'Limit CD Max exceeded'.

Step no.:	2.6
Switch off	Y/<u>N</u>

Here you can program if the plant has to be switched off when the conductivity is too high for the programmed delay. You can switch on the plant by switching off and on the controller.

3. Temperature

Step no.:	3.1
Temperature	2<u>5</u>°C

By entering the water temperature you can compensate the displayed conductivity value in accordance with the current temperature.
The conductivity measurement relates to a water temperature of 25 °C.
Deviating temperatures can be compensated for manually.

4. Conductivity correction factor

Step no.:	4.1
Factor	1,<u>00</u>*

Other measuring errors, for instance as a result of polarisation or cable capacities, can be compensated for here by entering a correction factor - at least for a certain range. Here you can enter a correction factor for conductivity between 0.10 and 5.0. Take a water sample and measure the conductivity with an accurate conductivity meter: calibration value. As a measuring value, note the read-out of the control. You can then calculate the correction factor that must be entered as follows:

Reference value

$$\frac{\text{Measured value}}{\text{Reference value}} = \text{Correction factor}$$

5. Level switches

Step no.:	5.1
Level switch	<u>1</u>

The storage tank is replenished via level switches.

Level switch = 1 :

The storage tank is replenished immediately when the water level falls below the full level. There is always a maximum volume available.

The 'IN' input can then be used for an excess pressure safety.

Level switch = 2 :

Alternatively, the system can be filled via two level switches. In that case the system is switched on when the low level is reached and switched off again when the high level is reached. Advantage: the system is switched on and off less frequently.

The 'IN' input is used for connecting the low-level switch.

Step no.:	5.2
Delay FU	<u>4s</u>

The switch-on delay for the high level switch can be programmed from 1 to 99 seconds. This step is only available when programmed for one level switch.

Step no.:	5.3
FU-EM 	

"|" Function is activated when contact is closed (NO).

"-" Function is activated when contact is open (NC).

6. Input functions

Delay for the 'Low water pressure' input function

Step no.:	6.1
Delay LP	1 <u>0</u> s

The delay for the low water pressure message can be programmed between 0 and 999 seconds.

Selecting the input function for input IN

Stap nr.:	6.2
<u>EP</u> ST	

Select your choice of input function for input IN.(EP= Exceeded pressure, ST=Stop)
Not programmable if two level switches are programmed.

Delay for the 'Exceeded pressure' input function

Step no.:	6.3
Delay EP	<u>2</u> s

The delay for the exceeded pressure message can be programmed between 0 and 999 seconds.

This step is skipped if two level switches have been programmed.

Delay for the 'Stop' input function

Step no.:	6.4
Delay ST	<u>4</u>s

The delay for the stop message can be programmed between 0 and 999 seconds. This step is skipped if two level switches have been programmed.

Automatic switch-on

Step no.:	6.5
Switch on	<u>60</u>s

Here you can program a delay between 1 and 999 seconds for the automatic switching on of the system after failure as a result of low water pressure or exceeded pressure.

Step no.:	6.6
ST-	<u> </u>

“|” Function is activated when contact is closed (NO).
“-” Function is activated when contact is open (NC).

7. Selection of output functions

Step no.:	7.1
<u>AL</u> CV	

Select the output function for relay output 3 (terminals 9, 10 and 11).

AL = Alarm

CV = Concentrate valve

When the function 'CV' is selected, the alarm function will not be available.

8. High-pressure pump delay

Step no.:	8.1
Pump delay	1 <u>5</u> s

To prevent water shock on switching on, in the 'Decrease' step first the input valve is opened and after the delay time (0-999 sec.) the high-pressure pump is activated.

9. Alarm

Step no. : 9.1
MI-MA-LP-EP-ST-

In this step you can program for which events the alarm relay must be activated.
("-" = not activated, "|" = activated).

MI = Minimum conductivity
MA = Maximum conductivity
LP = Low water pressure

EP = Exceeded pressure
ST = Stop

Step no. : 9.2
Rel.energ. Y/N

Here you can program whether the alarm relay must be enabled (Yes) or not (No) in case of malfunction.

Step no. : 9.3
Service Nr. Y/N

Here you can program if you want to display a service number together with an alarm message.

Step no. : 9.4
0031 73 443755

Program the service number.

10. Rinse after production

Step no.:	10.1
Rinse-Stanby	Y/N

Program whether the function "rinse after production" has to be activated.

Step no.:	10.2
Rinsetime	300s

Set a rinse time of 1 – 9999 seconds.

Step no.:	10.3
IV PU 	

Program whether inlet valve has to be opened ("I") or closed ("-") and high pressure pump has to be activated ("I") or not activated ("-") during the rinse cycle.

IV = Inlet valve

PU = High pressure pump

11. Interval rinse

Step no.:	11.1
Interval	Y/<u>N</u>

Program whether the function "rinse after production" has to be activated.

Step no.:	11.2
Distance	24<u>h</u>

Set the time lapse between the last production or rinse phase and switch over to this rinse function. A distance of between 1 and 999 hours can be programmed.

Step no.:	11.3
Rinsetime	300<u>s</u>

Set a rinse time of 1 – 9999 seconds.

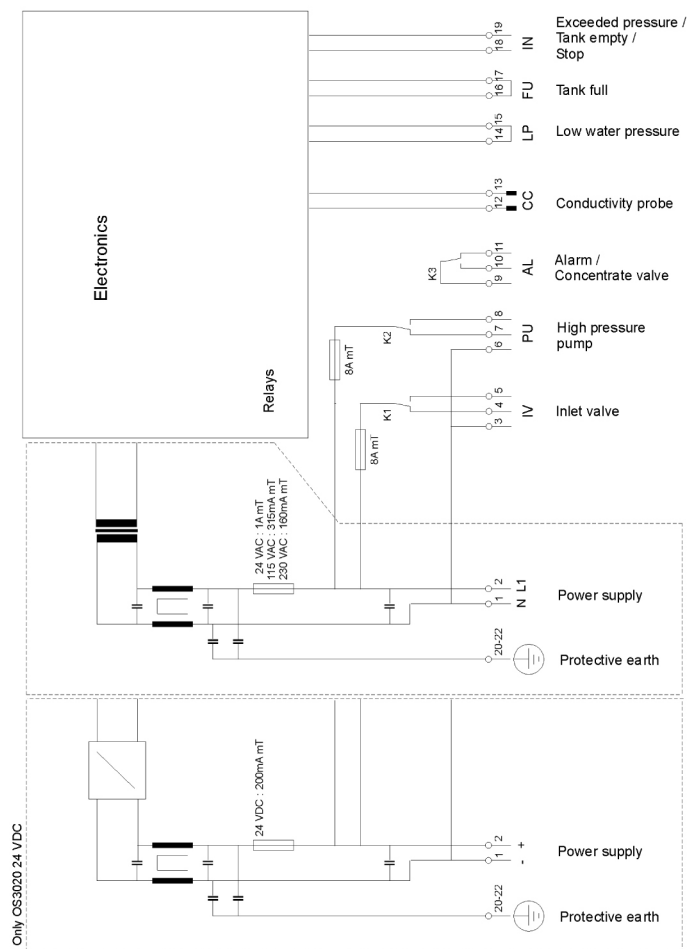
Step no.:	11.4
IV <u>P</u>U 	

Program whether inlet valve has to be opened ("|") or closed ("-") and high pressure pump has to be activated ("|") or not activated ("-") during the rinse cycle.

IV = Inlet valve

PU| = High pressure pump

Connection terminals OS3020



Technical data

Mains connection :	230VAC, 50-60 Hz, 160 mA fuse 115VAC, 50-60 Hz, 315 mA fuse 24VAC, 50-60 Hz, 1A fuse 24VDC, , 200 mA fuse
Power consumption :	4 VA
Inlet valve :	Voltage is equal to supply voltage, 8A fuse
High-pressure pump :	Voltage is equal to supply voltage, 8A fuse
Alarm output:	max. load 250V, 8A
Inputs :	loaded with 9V, 8mA
Protection class :	IP 65
Ambient temperature:	0 – 50 °C
Weight :	2 kg
Dimensions :	122 x 120 x 57 mm
Particulars :	Device protected against zero voltage