INDUSTRIAL
WATER EQUIPMENT

Controller for exchange cylinder systems

Instruction manual

Software version 2.00

Contents

General description

The EC3020 controller is used for the fully automatic monitoring and control of single or duplex cylinders for exchange cylinder systems, whereby the filter cylinders have to be regularly exchanged.

The basic controller parameters can be changed at any time; the programmed values are not lost in the event of a power failure.

The controller operates according to 7 steps, indicated as "Service Filter 1", "Standby Filter 1", "Service Filter 2", "Standby Filter 2", "No Service", "No Service 1+2" and "No Service 2+1".

The controller checks the conductivity of the water and if this exceeds a settable limit value, performs the following actions:
- In case of single filter systems, switches to "No Service".
The Service valve is closed and, once the cylinder is exchanged, the system must be switched on by hand using the external key.
- In case of duplex systems, switches to the other filter cylinder.
If the engaged filter cylinder, within a programmed period, also produces water with too high conductivity, the system is switched off.

After replacing the filter cylinders, these can be switched on by hand, using the key on the outside of the controller.

In single filter systems, the service valves of the cylinder must be connected to "SV1".

Step "Service Filter 1", "Standby filter 1"

Filter cylinder 1 produces demineralised during "Service filter 1".
As an option, it is possible to regulate the Service valve by 1 or 2 level switches.
If 1 level switch is set, the Service valve is opened after a delay, which can be programmed.
If 2 level switches are set, the Service valve is opened after a fixed delay of one second.
If the filter does not need to produce any water, the Service valve is closed and "Standby filter 1" appears in the LCD display.

The following values are monitored
- Conductivity under the minimum limit value (only if the Service valve is opened)
- The maximum conductivity limit value (from version 1.01.02 only if the service valve is opened).
- Inlet tank low level
- Inlet tank high level

Step "Service Filter 2", "Standby filter 2"

Filter cylinder 2 produces demineralised during "Service filter 2".
As an option, it is possible to regulate the service valve by 1 or 2 level switches.
If 1 level switch is set, the service valve is opened after a delay, which can be programmed.
If 2 level switches are set, the service valve is opened after a fixed delay of one second.
If the filter does not need to produce any water, the service valve is closed and "Standby filter 2" appears in the LCD display.

The following values are monitored
- Conductivity under the minimum limit value (only if the service valve is opened)
- The maximum conductivity limit value (from version 1.01.02 only if the service valve is opened).
- Inlet tank low level
- Inlet tank high level

Step "No Service"

This step only appears in single filter systems.
The system is switched off when the filter cylinder is saturated.
Once the filter cylinder is exchanged, it can be switched on by pressing the external key (press 1x).

Step "No Service 1+2"

If both filter cylinders shortly after one another produce water with too high conductivity, the system is switched off. Once the filter cylinders are exchanged, these must be switched on by pressing the external key (press 2x). Filter 1 will in this case be switched on first.

During this step, conductivity is not monitored and the service valves remain closed.

Step "No Service 2+1"

If both filter cylinders shortly after one another produce water with too high conductivity, the system is switched off. Once the filter cylinders are exchanged, these can be switched on by pressing the external key (press 2x). Filter 2 will in this case be switched on first.

During this step, conductivity is not monitored and the service valves remain closed.

Value and function display

First LCD line
The current status of the system is shown in the first line of the LCD display:
"Service Filter 1", "Standby filter 1", "Service Filter 2", "Standby filter 2",
"No Service 1+2" and "No Service 2+1".
In case of an alarm situation, an alternating message appears.

Second LCD line
The measured conductivity is shown in the second line of the LCD display.
ATTENTION! If the message "OFL" appears in the second line, the value falls
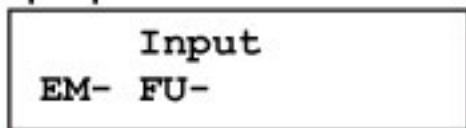outside the measurement range.

Example:

```
Service Filter 1
CM    40.0uS/cm
```

Info display

Various information can be called up by pressing the information key.
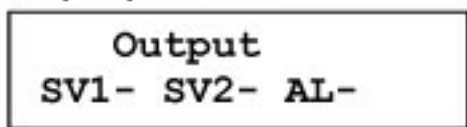Pressing the key again changes the information shown.

Input positions

```
        Input
EM-  FU-
```
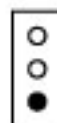
The current switch positions of the input functions are shown here.
EM = low level switch
FU = high level switch

Output positions

```
       Output
SV1-  SV2-  AL-
```

The current switch positions of the outputs SV1, SV2 and AL are shown here.
SV1 = Service valve filter 1
SV2 = Service valve filter 2
AL   = Alarm

Software version

```
Software version
EC3020    1.01.00
```
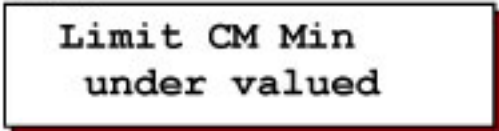
The software is regularly updated to ensure that the product complies with the latest insights and needs.
The number of the operational version is indicated.

Alarm

If the alarm relay is activated, it can be deactivated by pressing the external key. Although this deactivates the relay, the message is still shown in the LCD display. Press the key again to remove the message.
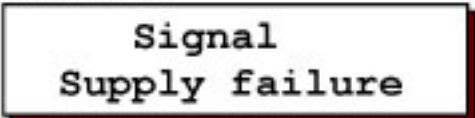
CM MIN

```
Limit CM Min
  under valued
```

The conductivity value of the conductivity meter has dropped below the set minimum limit value. The system remains operational.
The message in the LCD display can be switched off as soon as the minimum limit value is again exceeded. The alarm relay can be activated.

Power failure

```
    Signal
Supply failure
```

It is possible to program an alarm in case a power failure occurs while the controller is operational.

Exchange cylinder 1

```
    Exchange
    Cylinder 1
```

This message appears if filter 1 has produced water with too high conductivity and the filter cylinder needs to be exchanged.
The message is not programmable and is always transmitted to the alarm relay.

Exchange cylinder 2

```
    Exchange
    Cylinder 2
```

This message appears if filter 2 has produced water with too high conductivity and this filter cylinder needs to be exchanged.
The message is not programmable and is always transmitted to the alarm relay.

Exchange cylinder 1 +2

```
    Exchange
    Cylinder 1+2
```

This message appears if both filters shortly after one another produce water with too high conductivity and the cylinders of these filters need to be exchanged. When switching on the system by hand, filter 1 will be engaged first.
The message is not programmable and is always transmitted to the alarm relay.

Exchange cylinder 2+1

```
    Exchange
    Cylinder 2+1
```

This message appears if both filters shortly after one another produce water with too high conductivity and the cylinders of these filters need to be exchanged. When switching on the system by hand, filter 2 will be engaged first.
The message is not programmable and is always transmitted to the alarm relay.

Input functions

The inputs 'storage tank empty' (EM), 'storage tank full' (FU) and 'Alarm reset' (IN) are included as standard.

Tank full / Tank empty

The input functions 'Tank full' (FU) and 'Tank empty' (EM) are used for the automatic filling of a storage tank.
The use of 0, 1 or 2 level switches can be set in step 5.1.

Filling up takes place:
- always if no level switch is connected.
- subject to a programmable delay if one level switch is set.
- subject to a fixed delay of one second if two level switches are set.

The input function FU is active when the contact is open.
The input function EM is active when the contact is closed.

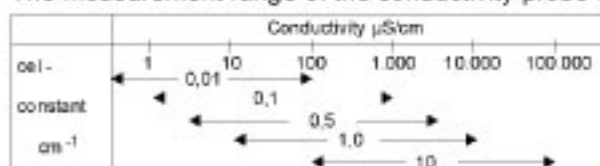If the storage tank is empty, the contact of both level switches should be closed.

Alarm reset

No further programming possible. The input is connected to the built-in switch on delivery.

Conductivity probe

The connection for the conductivity probe is indicated by 'CC'.
The measurement range of the conductivity probe depends on the cell constant.

The cell constant can be programmed in step 2.1.
Also, it is possible to set the minimum and maximum limit values with a programmable delay time. Whether the alarm relay should be activated in the case of a specific message can be set in step 9.1.
It is also possible to compensate for the temperature factor in the conductivity measurement. The water temperature can be programmed in step 3.

Temperature compensation
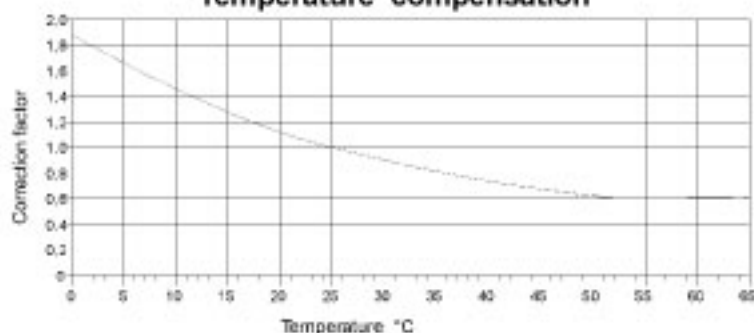
Example:
Set/measured water temperature: T   = 11 °C
Measured conductivity value: C_{11} = 100 µS/cm
Applicable correction factor: K   = 1.4
Shown conductivity value: C_{25} = 140 µS/cm

Output functions

The outputs 'Service valve 1' (IV), 'Service valve 2' (PU) and 'Alarm' (AL) are included as standard.

Service valve 1
Service valve 1 is opened if the first filter is activated and, possibly dependent on one or more level switches, demineralised water must be produced.
The maximum current load on this output is 8A (fused).

Service valve 2
Service valve 1 is opened if the second filter is activated and, possibly dependent on one or more level switches, demineralised water must be produced.
The maximum current load on this output is 8A (fused).

Alarm
The alarm relay can be activated under certain conditions, such as:
  - minimum conductivity value exceeded
  - power failure
  - switch to filter 1
 - switch to filter 2
  - system switch off
Energizing of the alarm relay in case of a failure can also be programmed.

Changing and calling up the basic parameters

On taking the controller into operation, the operating values of the reverse osmosis system are set by entering the basic parameters.
These values can be changed at any time, but will not be lost in the event of a power failure.

To prevent accidental program changes, the key must be pressed for four seconds before gaining access to the programming mode.
Simply press the same key to navigate the programming mode.
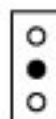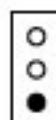
The programming mode is automatically exited approx. 2 minutes after the last key operation or by entering the indicated key combination.

Press the top key to move the cursor.
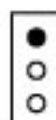
Use the bottom key to change numerical values, which you have selected with the cursor, within the available range.
Also use this key to switch between '-' and '|' in case of option questions.

1. Language

```
Step no.:      1.1
D   Nl  E   F
```

The language can be set in the step.

2. Number of filters

```
Step no.:      2.1
No. of filters 2
```

Enter the number of filters installed in the system.

3. Conductivity meter

```
Step no.:      3.1
Constant      0.10
```

A measurement cell with a specific cell constant must be selected depending on the required conductivity of the water. Here, a cell constant of 0.01 to 10.00 cm^{-1} can be programmed for the conductivity meter.

```
Step no.:      3.2
Value Min      1.0
```

An electronic interruption of the measurement cell, electronic defects in the system or air in the measurement cell

can erroneously result in very low conductivity values. For monitoring purposes, a limit value of 0.0 to 999 µS/cm can be entered.

```
Step no.:      3.3
Delay          60s
```

After a programmed delay time of 1 to 9999 seconds, a drop below the limit value will result in the error message 'Value CD Min below the limit value' being shown in the LCD display.

```
Step no.:      3.4
Value Max    100.0
```

A change in the quality of the supply water can lead to change in conductivity. For monitoring purposes, a limit value of 0.2 to 6500,0 µS/cm can be entered.

```
Step no.:      3.5
Delay          180s
```

If, after a programmed delay time of 1 to 9999 seconds, the maximum conductivity value is exceeded, the system will switch to the other filter cylinder.

```
Step no.:      3.6
Delay2         180s
```

If, after switching to the other filter cylinder, the maximum conductivity is exceeded within the second programmed delay time, the system will be switched off and can only be switched on again by hand.

4. Temperature

```
Step no.:      4.1
Temperature 25°C
```

By entering the water temperature, the indicated conductivity value can be compensated to allow for the current temperature.
The conductivity measurement is based on a water temperature of 25 °C. In case of a higher or lower temperature, this can be compensated by hand.

5. Compensation correction factor

```
Step no.:      5.1
Factor       1.00*
```

Other measuring errors, which may arise through valorisation or cable capacities, for example, can be compensated here by entering a correction factor, varying from 0.10 to 5.0.
Take a water sample and measure the conductivity using an accurate conductivity meter: this results in the calibration value. Record the controller reading as the measurement value.
Use the formula below to calculate the correction factor:

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

6. Level switches

```
Step no.:      6.1
Level switch    1
```

Refilling of the storage tank is controlled with the aid of level switches.

Level switch = 1 :
The storage tank is immediately refilled if the level of the water drops below full. A maximum quantity is always available.

The 'IN" input can in that case be used as overpressure safeguard.

Level switch = 2 :
An alternative is to use two level switches for refill control. Here, the system is switched on and when the low level is reached and switched off when the high level is reached.
Advantage: the system is not switched on and off as often.

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

```
Step no.:      6.2
Delay FU       4s
```

The refill delay on the high level switch can be programmed between 1 and 99 seconds.
This step can only be programmed if 1 level switch is set.

7. Alarm

```
Step no.:      7.1
MI-PF-
```

In this step, you can program the events that will activate the alarm relay ("-" = not activated, "|"= activated).
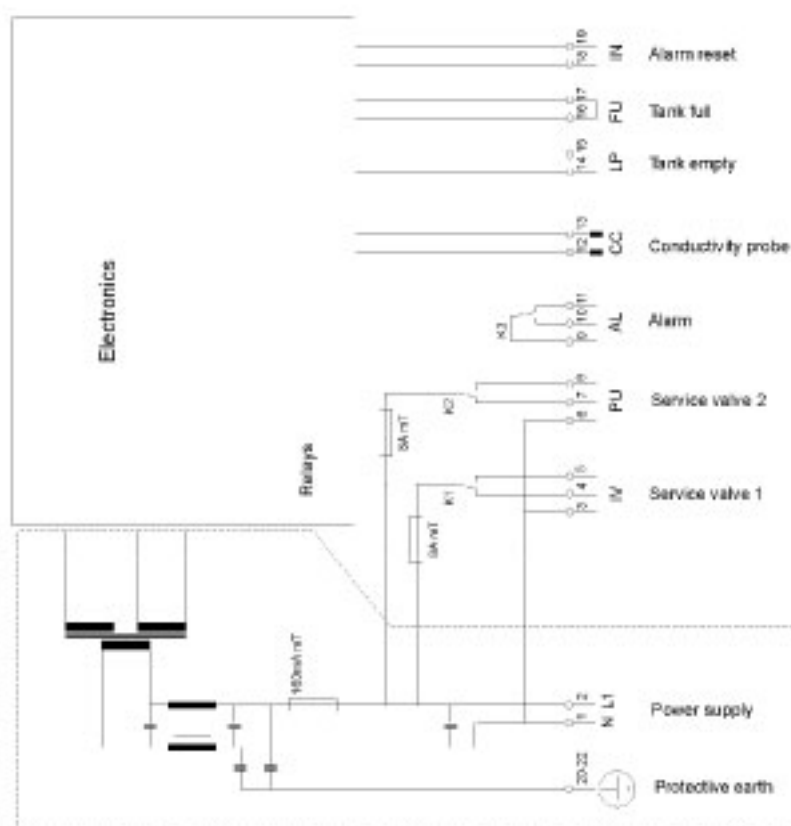
MI   = minimum conductivity
PF   = power failure

```
Step no.:      7.2
Rel.energ.    Y/N
```

Here, you can program whether the alarm relay should be energized (Yes) or not (No) in case of a failure.

Connection terminals
EC3020

Technical specifications

Power connection:	230V, 50-60 Hz, fuse 160 mAT 115V, 50-60 Hz, fuse 315 mAT 24V, 50-60 Hz, fuse 1AT
Power consumption:	4 VA
Service valve 1:	Voltage is equal to supply voltage, 8AT fuse
Service valve 1:	Voltage is equal to supply voltage, 8AT fuse
Alarm output:	max. current 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
Special features:	protected against zero voltage