
ES2070 CA

Control for demineralisation installations



Instruction manual

Software version 1.01

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1. General description

1.1. General

The ES2070 CA is used for the automatic control and monitoring of demineralisation installations.

The flexible, programmable software makes this control suitable for a large number of different applications in the field of water treatment.

Overview of functionality

- Menu-driven operating and programming of the control by means of keys and a 2-line display.
- Choice of language. (i.e. Dutch, English, German, French and Italian).
- Universally applicable to demineralisation installations.
- Flexibly programmable for specific user requirements.
- Demineralised water production via manual control or level switches.
- Free programmable service phone number.
- Inputs: water meter, level chemical tank cation / level chemical tank anion, level storage tank, waiting and external regeneration start
- Measuring: 1 conductivity meter and 1 temperature meter.
- Integrated conductivity meter with automatic measuring range switch
- Measuring range of the conductivity in accordance with the measuring cell used (0.1 – 100,000 $\mu\text{S}/\text{cm}$).
- Cell constant of the measuring cell programmable from 0.01 – 10.00 cm^{-1}
- Manually or automatically operated (optional) temperature conversion
- Outputs: programmable for individual valves and central control valves
suction valve cation, suction valve anion, rinsing valve, refuelling valve cation, refuelling valve anion, flow pulse, circulation pump, regeneration, alarm
- Voltage drop-out protection program information, program information is saved without battery
- Produced according to EMC directives
- Housing suitable for wall mounting
- Available in 24/24V, 115/115V, 230/230V, 115/24V, 230/24V, 240/24V

1.2. List of abbreviations used

Herewith a list of frequently used abbreviations

RV	Rinsing valve	VA	Valve
FCC	Refuelling valve for the chemical tank cation	FCA	Refuelling valve for the chemical tank anion
CP	Circulation pump	FP	Flow pulse
RE	Regeneration output	AL	Alarm output
WM	Water meter	FU	Level switch storage tank
RCC	Level switch chemical tank cation	WA	Wait
RCA	Level switch chemical tank anion	RS	Regeneration start




Demineralisation phases

The control distinguishes different phases:

- | | |
|-----------------------|--|
| - Service | Production of demineralised water |
| - Stand by | Installation is switched off so no water is produced |
| - Regeneration cation | The cation filter is being generated |
| - Regeneration anion | The anion filter is being generated |

1.3 Phase “Service”

During the “service” phase the service valve is open and demineralised water is being supplied. If required, a switch can be made via a level switch between “service” and “stand by”. This function needs thus to be activated (see § 14.4 “Input functions” on page 32).

The installation can be switched off manually by using the  key, regardless of whether the storage tank is empty or not. The installation is only switched on again then when the key is pressed again.

During the “service” the following message may appear in the LCD display:



In the first line it is indicated that the installation is in the “service” mode.

In the second line various values can be displayed alternately, namely:

- actual real time clock (is displayed always)
- measured conductivity (if not set on LED display, see § 14.1 on page 26).
- measured temperature (if set on LCD display, see § 14.2 on page 28). See also § 3.3 “LCD display” on page 8

Regeneration can be started subject to one or more conditions. See also § 7 “Regeneration start conditions” on page 16 and 14.7 “Regeneration starts” on page 38.

During service the following inputs are monitored:

- Conductivity meter
- Temperature sensor
- Digital inputs:
 - Water meter
 - Level switch storage tank
 - External regeneration start

During service the following output functions are activated:

- Service valve(s) opened (always open)
- Circulation pump (if programmed, see § 14.3.4 “Circulation pump” on page 30).
- Rinsing valve (if programmed, see § 6.3 “Rinsing valve” on page 14 and § 14.3 on page 29)

A counting device keeps a tally with regards to maintenance (if the maintenance interval is programmed, see § 14.9 “Maintenance” on page 41).



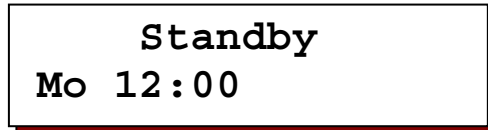
1.4 “Stand by” Phase

The service valve is closed during the “stand by” phase.

The phase can only be accessed if the function of the level switch in a storage tank is activated (see § 14.4 “Input functions” on page 32) or by switching off the installation manually by using the

 key. The installation is only then switched on again if the key is pressed again.

During “stand by” the following messages may appear in the LCD display:



In the first line is indicated that the installation is in the “stand by” mode.

In the second line a number of values may be displayed alternately, namely:

- actual real time clock (always displayed)
- measured conductivity (if not set on LED display, see § 14.1 on page 26).
- measured temperature (if set on LCD display, see § 14.2 on page 28).
- installation manual off. See also § 3.3 “LCD display” on page 8

Regeneration may be started subject to one or more conditions.

Based on the following conditions regeneration can be started:

- Interval period (after set interval period)
- Clock (at set day / time)
- External (via an external contact)
- Manually controlled

See also § 7 “Regeneration start conditions” on page 16 and 14.7 “Regeneration starts” on page 38.

During “stand by” the following inputs are checked:

- Digital inputs:
 - Level switch storage tank
 - External regeneration start

During “service” the following output functions are activated:

- Service valve(s) (always closed)
- Circulation pump (if programmed, see § 14.3.4 “Circulation pump” on page 30).



1.5 Phase “Regeneration cation”

During the “Regeneration cation” the service valve will be closed and the cation filter will be regenerated. It is possible to fill up the chemical tank for the cation filter beforehand, with or without monitoring the level of the chemical tank (see § 6.4 “Refuelling valve” on page 14 and § 14.3 “Output functions” on page 29).

For cation and anion filter the number of regeneration steps, the period of each regeneration phase and the “compression time” of the chemicals, if required, are separately programmable.

Regeneration can be started subject to one or more conditions and depends on the phase the installation is in.

See also § 7 “Regeneration start conditions” on page 16 and 14.7 “Regeneration starts” on page 38.

During “Regeneration Cation” the following messages may appear in the LCD display:

<p>Regen. Cation Phase: 1 10m</p>

In the first line is indicated that the cation filter is being regenerated.

In the second line several values can alternately be displayed, namely:

- wait for regeneration
(if a regeneration limitation as discussed in the following overview of inspections at the start and / or during the regeneration is fulfilled)
- remaining filling time of the filling program
(if programmed, see § 6.4 “Refuelling valve” on page 14)
- actual regeneration phase + remaining time
see also § 3.3 “LCD display” on page 8

At the start of and / or during “regeneration cation” the following items are inspected:

- Digital inputs:
 - Level chemical tank cation (only at the start of a regeneration and if programmed, see § 8.3 “Chemical level switch (RCC / RCA)” on page 18 , § 14.4 “Input functions” on page 32 and § 14.8.3 “Level chemical tank (cation / anion)” on page 40).
 - Wait (as well as at the start as during the regeneration and if programmed, see § 8.1 “Input “Wait” (WA)” on page 18, § 14.4 “Input functions” on page 32 and § 14.8.2 “Input “Wait”” on page 40).
- Real time clock
If programmed at the start of the regeneration it is verified if the day and time fall inside the time zone where regenerations should not take place. (see § 8.2 “Prohibited regeneration” on page 18 and § 14.8.1 “Prohibited regeneration” on page 40)

During “Regeneration Cation” the following output functions are activated:

- Service valve(s) closed (always closed)
- Refuelling valve before the actual regeneration and if programmed, see § 14.3 op 29.
See also § 6.4 “Refuelling valve” on page 14.
- Suction valve During the set phase and during the set time and if programmed on pulse control or switching control.
See § 14.3 “Output functions” on page 29.
See also § 6.2 “Suction valve” on page 14.
- Regeneration-output if programmed, see § 14.3 on page 29).
See also § 6.7 “Regeneration output” on page 15.

The regeneration phases can also be passed through quickly via the manual function “Fast regeneration” (see § 10.4 “Fast regeneration ” on page 21). It is also possible to interrupt the regeneration (see § 10.3 “Immediately terminating regeneration” on page 20).



1.6 Phase “Regeneration Anion”

During the “Regeneration Anion” phase the service valve will be closed and the anion filter will be regenerated. It is possible to fill up the chemical tank beforehand for the purpose of the anion with or without monitoring the level of the chemical tank (see § 6.4 “Refuelling valve” on page 14 and § 14.3 “Output functions” on page 29).

For cation and anion filter the number of regeneration steps, the period of each regeneration phase and the “compression time” of the chemicals, if required, are separately programmable.

Generation can be started subject to one or more conditions and depends on the phase the installation is in.

See also § 7 “Regeneration start conditions” on page 16 en 14.7 “Regeneration starts” on page 38.

During “regeneration anion” the following messages may appear in the LCD display:

<p>Regen. Anion Phase: 1 10m</p>
--

In the first line is indicated that the cation filter is being regenerated.

In the second line several values can alternately be displayed, namely:

- wait for regeneration
(if a regeneration limitation as discussed in the following overview of inspections at the start and / or during the regeneration is fulfilled)
- remaining filling time of the filling program
(if programmed, see § 6.4 “Refuelling valve” on page 14)
- actual regeneration phase + remaining time
see also § 3.3 “LCD display

At the start of and / or during “regeneration anion” the following items are inspected:

- Digital inputs:
 - Level chemical tank cation (only at the start of a regeneration and if programmed, see § 8.3 “Chemical level switch (RCC / RCA)” on page 18 , § 14.4 “Input functions” on page 32 and § 14.8.3 “Level chemical tank (cation / anion)” on page 40).
 - Wait (as well as at the start as during the regeneration and if programmed, see § 8.1 “Input “Wait” (WA)” on page 18, § 14.4 “Input functions” on page 32 and § 14.8.2 “Input “Wait”” on page 40).
- Real time clock
If programmed at the start of the regeneration it is verified if the day and time fall inside the time zone where regeneration should not take place. (see § 8.2 “Prohibited regeneration” on page 18 and § 14.8.1 “Prohibited regeneration” on page 40)

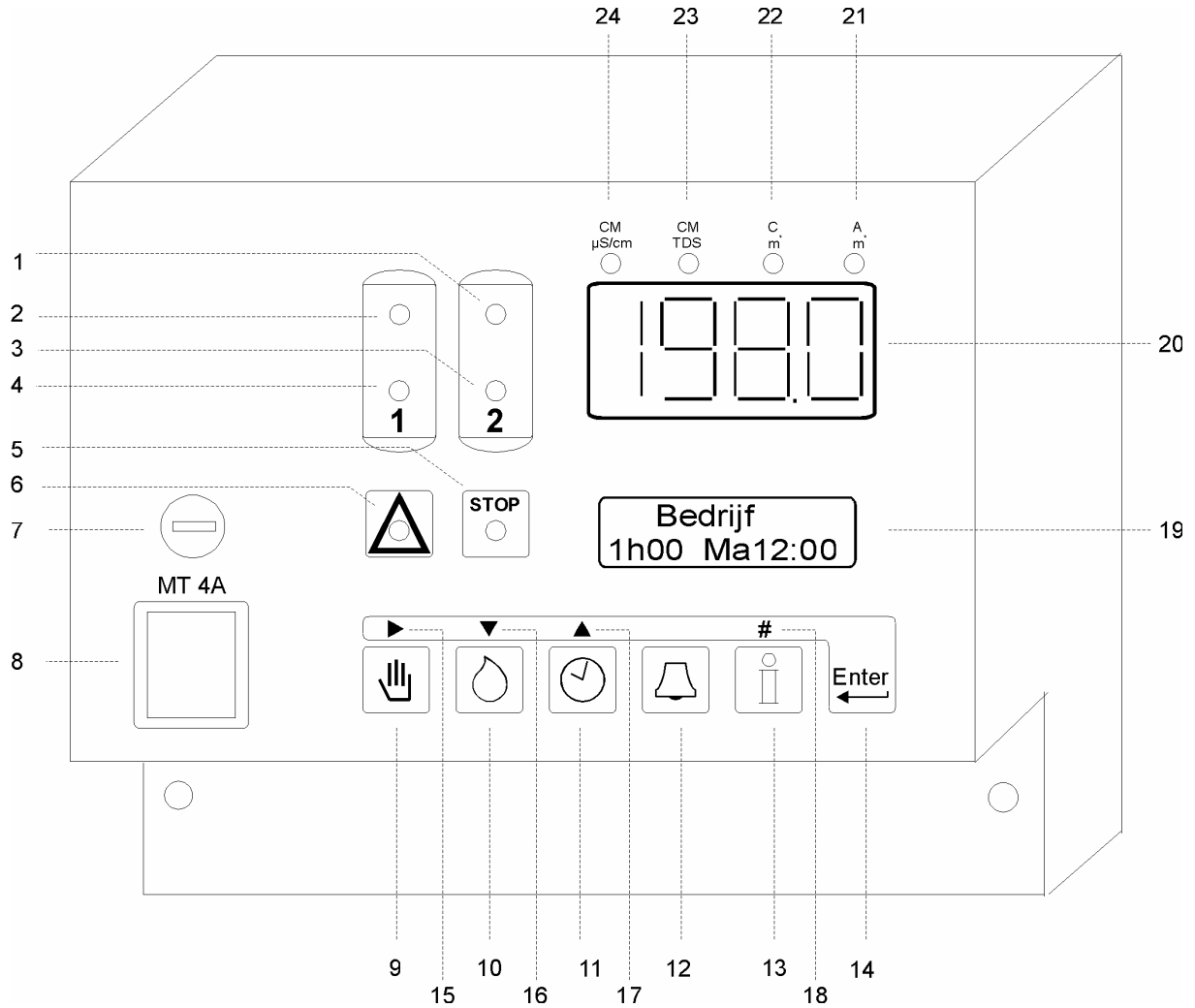
During “regeneration anion” the following output functions are activated:

- Service valve(s) closed (always closed)
- Refuelling valve before the actual regeneration and if programmed, see § 14.3 op 29.
See also § 6.4 “Refuelling valve” on page 14.
- Suction valve During the set phase and during the set time and if programmed on pulse control or switching control.
See § 14.3 “Output functions” on page 29.
See also § 6.2 “Suction valve” on page 14.
- Regeneration output if programmed, see § 14.3 at 29).
See also § 6.7 “Regeneration output” on page 15.

Regeneration phases can always be passed through via the manual function “Fast regeneration” (see § 10.4 “Fast regeneration ” on page 21). It is also possible to interrupt the regeneration (see § 10.3 “Immediately terminating regeneration” on page 20).

2 Picture front side

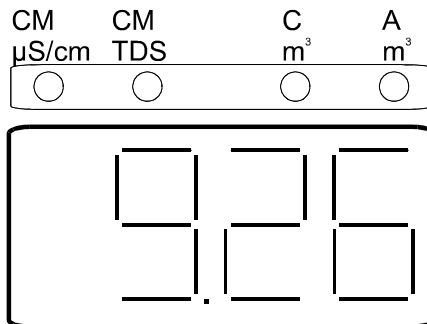
Wall mounting



- | | | | |
|------------------------------|-----------------------|-----------------------|-------------------------|
| 1. LED "Service" anion | 7. Relay | 13. Info | 19. LCD display |
| 2. LED "Service" cation | 8. Main switch | 14. Programming | 20. LED display |
| 3. LED "Regeneration" anion | 9. Regeneration start | 15. Move cursor | 21. Not used |
| 4. LED "Regeneration" cation | 10. Not used | 16. Next program step | 22. Display cation |
| 5. Not used | 11. Set clock | 17. Last program step | 23. Display CM in TDS |
| 6. LED alarm | 12. Reset | 18. Digital input | 24. Display CM in µS/cm |

3 Measuring and function display

3.1 LED Display



In the LED display the value of the conductivity meter (in $\mu\text{S}/\text{cm}$ or rpm) is displayed and / or of the remaining capacity of the cation filter is displayed.

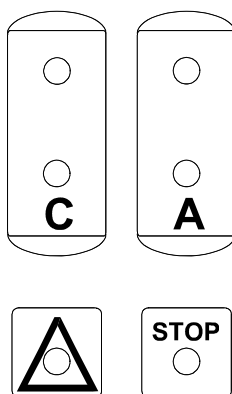
If both values should be displayed these will alternately appear in the display. The LED lights above the display indicate which parameter is displayed in the LED display.

If the value of the conductivity or remaining capacity lies beyond the range of possible displays, the message OFL appears (overflow).

The remaining capacity can also show a negative value. This happens when the water meter is programmed, but no automatic regeneration can start if the remaining capacity has reached the value of zero. The negative value indicates the quantity of water that has been supplied after reaching the set (expected) quantity of water.

When the message "----" appears in the display, it means the conductivity measuring is displayed in the LCD display.

3.2 LED displays



Meaning of LEDs per filter indication:

Green	Yellow	Meaning
Blinking	Off	Stand by
On	Off	Service with service valve opened
Off	Blinking (0,5 sec)	Wait for start regeneration with closed service valve
Off	Blinking (2 sec)	Filling program
Blinking	Blinking (0,5 sec)	Wait for start regeneration with closed service valve for input FU.
Off	On	Regeneration

Alarm-LEDs:

- Red Led left : an alarm situation is occurring
- Red Led right : is not being used



3.3 LCD display

In the first line of the LCD display the actual status of the installation is always displayed, Example given “service”, “stand by” and “regeneration cation”.

In the second line of the LCD display various messages may appear depending on the status of the installation. Below the various messages will be described in detail.

3.3.1 Display during “service”



Service
Mo 12:00

During “service” the actual clock is always displayed. In case an interval period is programmed this will be put first and the clock indication moves to the right.

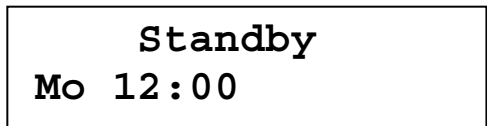


Service
71h58 Mo 12:00

Depending on the programming the following values may be displayed alternately:

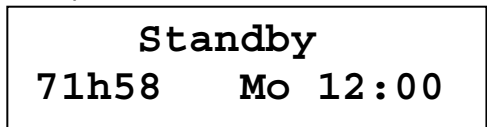
- Measured conductivity (dep. step 1.1)
- Measured temperature (dep. step 2.3)
- Remaining rinsing time (if rinsing is programmed)

3.3.2 Display during “stand by”



Standby
Mo 12:00

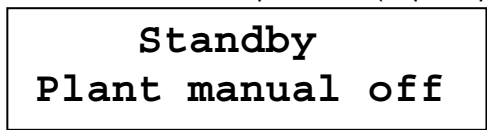
During “Stand by” the actual clock is always displayed. In case an interval period is programmed this will be put first and the clock indication moves to the right.




Standby
71h58 Mo 12:00

Depending on the programming the following values can be displayed alternately:

- Measured conductivity (dep. step 1.1)
- Measured temperature (dep. step 2.3)



Standby
Plant manual off

If the installation is switched off manually while the level switch in the storage tank indicates insufficient level, it will indicate that the installation was switched off manually. The installation can only be switched on manually by using the  key. Even after a power loss this situation will still exist and the installation should be switched on manually.

3.3.3 Display during “regeneration cation”

During “regeneration cation” the following messages may appear in the second line:

```

Regen. Cation
Phase: 1      70m

```

Regeneration runs and at the left the actual regeneration phase is displayed, on the right the remaining time of the relevant phase is indicated.

```

Regen. Cation
wait for regen

```

If the abovementioned text is displayed the regeneration start will be blocked.

This can happen because (if function(s) is/are activated):

- Input “Wait” is activated
- Regeneration is Prohibited
- Input “chemical tank cation” (if no refuelling valve is programmed).

Also a message appears in the LCD display to indicate which situation is causing the regeneration blocking. This message is alternately displayed as shown above.

```

Regen. Cation
Filltime Ca. 18m

```

```

Regen. Cation
Filltime An. 18m

```

In case the chemical tank filling function is activated during filling the above mentioned text will be displayed. On the right the remaining time of the filling program is displayed. If the refuelling valve function for the anion filter is also programmed, the remaining time hereof will also be displayed.

```

Regen. Cation
Fill failure Ca.

```

```

Regen. Cation
Fill failure An.

```

If in combination with the refuelling valve the monitoring on the chemical tank level is also activated and after the filling time has terminated the level in the chemical tank is still insufficient, a message will be shown that an error occurred while filling up the tank. Again, this also applies to the filling program of the anion filter.

```

Regen. Cation
Suction time 20m

```

If central control valves are used a suction valve can be connected. In case this valve is open the remaining time will be indicated. At the time this valve is closed again, this message disappears from the LCD display.

3.3.4 Display during “regeneration anion”

During regeneration of the anion filter similar messages appear such as already discussed in the preceding chapter “Display during “regeneration cation””.

The text “regeneration cation” is then replaced by the text “regeneration anion”. The messages regarding the filling program of the cation filter will not be displayed again.

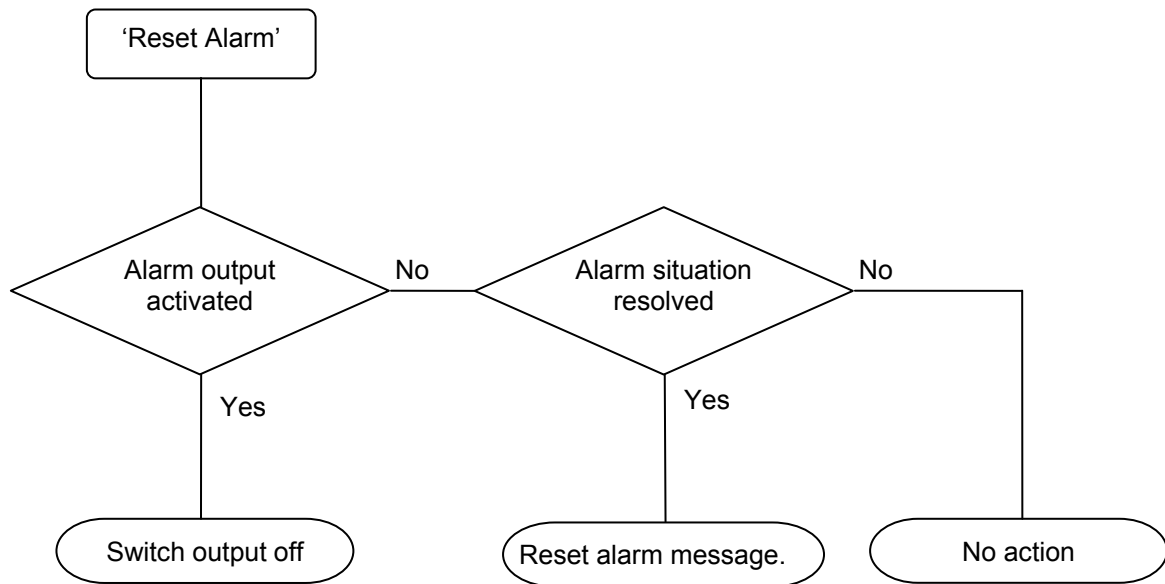


3.4 Display alarm indications

In case of an alarm situation a message appears in the LCD display. This message is shown alternately with the standard message(s).

Which messages can be shown in the LCD and their meaning is discussed in § 15 “Possible error ” on page 42

Below is a flow diagram showing in which way an alarm indication can be manually reset.





4 Input functions

4.1 Water meter

If the water meter function is activated the impulses of the connected water meter are counted. In the LED display the remaining capacity of the cation filter is indicated.

If the remaining capacity shows zero, regeneration can be started. This is adjustable in advance. (see § 14.7.2 "Water meter" on page 38).

In case no automatic regeneration is set because of the water meter, a negative value might appear in the LED display which indicates the filter has already supplied more water at that moment than the set capacity.

(see § 3.1 "LED Display" on page 7).

At the end of the regeneration of the cation filter the capacity is reset.

Per second a maximum of 10 impulses can be given.

See also § 14.4 "Input functions" on page 32.

4.2 Level switch chemical tank (cation / anion)

If the input function for the relevant level switch is activated, the chemical supply can be monitored and if necessary, regeneration can be prevented by insufficient level. During regeneration the relevant input is not being monitored.

In case the alarm output is activated because of the input function chemical tank, this out can be switched off manually. The alarm relay and the message in the display are automatically switched off if the input is no longer active.

If the refuelling valve is programmed as well for the relevant filter a special filling program is activated. See § 6.4 "Refuelling valve" on page 14.


See also § 8.3 "Chemical level switch (RCC / RCA)" on page 18, § 14.4 "Input functions" on page 32 en § 14.8.3 "Level chemical tank (cation / anion)" on page 40.

4.3 Level switch storage tank

If this input function is activated the installation can be switched to "service" or "stand by" by means of the relevant input.

If the installation is in "service" it can always be switched off manually.

In the LCD display is then displayed, that the installation is switched off manually. The installation can only be switched on manually.

Switching on and off can be realised by pressing the  key.

See also § 14.4 "Input functions" on page 32.



4.4 Wait

By means of this input function a regeneration can be prevented or a running regeneration can be stopped (counting device of the actual regeneration phase is switched off).

After cancelling the input signal the regeneration is started / continued.

If the alarm output is activated because of the input wait then this cannot be switched off manually. The alarm relay and the message on the display will automatically be disconnected in case the input is no longer active.

See also § 14.4 “Input functions” on page 32 en § 14.8.2 “Input “Wait”” on page 40.

4.5 External regeneration start

An external regeneration can be started by means of this input.

The input is blocked during regeneration and liberated after regeneration and expiring of the set “ignore” time (step 4.20).

Attention: The “ignore” time is also activated after a power loss to wait for fresh measuring of a control device contiguously.

See also § 14.4 “Input functions” on page 32, § 14.4.6 “Regeneration start” on page 33 and 14.7.4 “External contact” on page 38.



5 Measuring functions

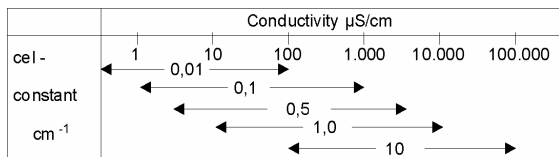
5.1 Conductivity measuring

The control is equipped, as standard, with a conductivity meter, which measures the conductivity of the water at the anion filter output.

The conductivity meter is equipped for two measuring ranges with automatic switches.

The measuring ranges depend on the applied measuring cells and have a range from very pure water $< 0.1 \mu\text{S}/\text{cm}$ to very saline water $< 100 \text{ mS}/\text{cm}$.

Measuring cells can be used with cell constants between 0.01 and 10.00 cm^{-1} .



For the functional control of the conductivity measuring a bottom limit value can be programmed constantly, and for the quality control of the water a top limit value can be programmed. The delay time for actions to be taken can then be programmed.

If the control is set on the maximum conductivity, the rinsing valve function can be opened during a set time. During rinsing the service valve of the anion filter will be automatically closed

In case no rinsing function is activated, or the rinsing time has expired and the conductivity is still above the set limit value, it can be preset if regeneration should follow automatically or if an alarm should follow after which regeneration should be started manually.

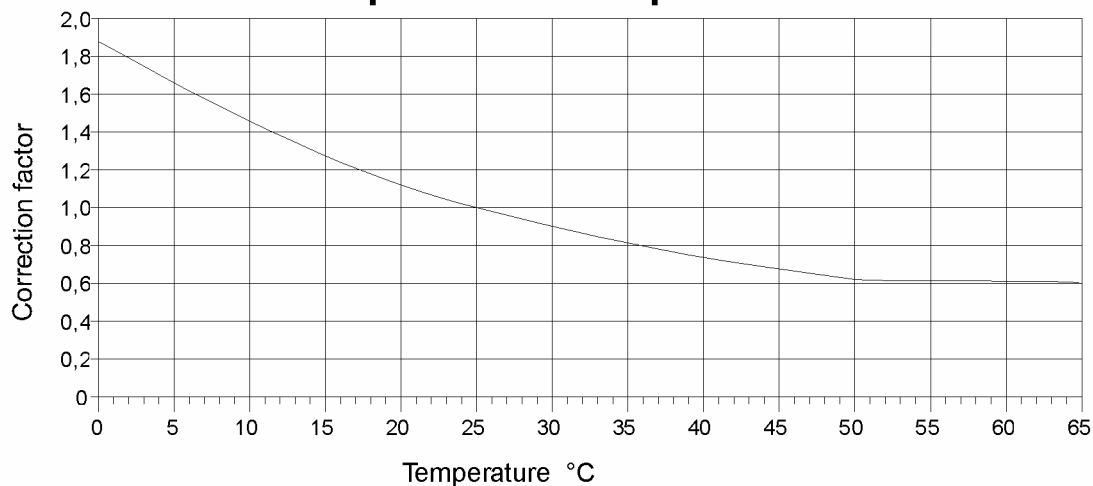
5.2 Temperature

The control is equipped, as standard, with a temperature meter that measures the temperature of the water. The conductivity measuring can be compensated automatically by means of the measured temperature.

In case no temperature sensor is connected to the input, it is automatically switched over to the manual set temperature.

In the diagram below the correction as a result of the temperature can be read out.

Temperature compensation





6 Output functions

In this chapter the various output functions are described, such as:

- Electrical control of the filters
- Suction valve cation / anion
- Rinsing valve
- Refuelling valve cation / anion
- Circulation pump
- Flow pulse
- Regeneration output
- Alarm

6.1 Electrical control of the filters

The control is suitable for controlling a cation / anion installation constructed with individual valves as well as for an installation constructed with central control valves, powered by a pulse system or a switching system.

See § 14.3 “Output functions” on page 29.

6.2 Suction valve

The output function “suction valve” can only be activated if the electrical control is programmed based on a switching system (Alt) or a pulse system (Imp).

It can be set if the compression needs to take place in phase 1 or phase 2 of the regeneration.

The compression time is also programmable. However, if the programmed period is longer than the set time of the regeneration phase compressing will immediately stop upon switching to the next regeneration phase, and the period will not be completed.

6.3 Rinsing valve

The rinsing valve can only be opened during the service phase. The service valve of the anion filter is closed during rinsing.


The rinsing valve function is to be activated as well as the monitoring of the maximum conductivity. In case the measured conductivity exceeds the set limit value during the set delay time, the rinsing valve will be opened again. The rinsing time is adjustable. If the measured conductivity drops below the maximum limit value the valve will be closed.

If the measured conductivity is still not ok after the rinsing time has finished, depending on the programming, the regeneration will start or an alarm can be given.

6.4 Refuelling valve

Preceding the final regeneration by activating the “refuelling valve” function (see § 14.3 “Output functions” on page 29) a filling program can be started. Herewith a chemical tank can be filled just before the beginning of regeneration (for example an HCl tank or a NaOH tank). The refuelling valve will be opened for a set time.


After the relevant high level switch of the chemical tank is activated it can be verified whether the filling process has worked well. If the level in the chemical tank has risen sufficiently within the preset filling time, then the filling valve is closed and regeneration can start. In this case the filling time will not be completed.

When the filling time has passed and the tank level is still not sufficient a message will appear in the LCD display. By means of the  key the filling program can be restarted. The message disappears from the LCD display and the eventually set alarm output is deactivated.

In case the cation filter and the anion filter need to be regenerated, both filling programs will be activated simultaneously preceding the regeneration of the cation filter.

The anion filter level monitoring in the chemical tank will only then be monitored at the time the anion filter actually wants to start regenerating.



It can also be set if after regeneration it should be verified whether the level in the chemical tank has sufficiently dropped. If not, regeneration of the relevant filter can be restarted by pressing the  key. In case of a power loss during the filling program the remaining time will be saved. Upon starting, the control continues filling (at the most) during the remaining filling time.

During filling up the chemical tank the relevant yellow LED will start blinking with an interval period of 2 seconds.

6.5 Circulation pump

During "service" and / or "stand by" a circulation pump can be switched on.

If the pump should be switched on during "service" it will be switched on continuously. During "stand by" the pump can also be operated at intervals.

The function should be activated (see § 14.3 "Output functions" on page 29).

The pump can be switched on continuously or based on time intervals during a programmable period (see § 14.3.4 "Circulation pump" on page 30).

When the installation is in the "regeneration" phase, the pump will always be switched off.

6.6 Flow pulse

By means of the "flow pulse" function incoming water meter pulses can be forwarded to e.g. a dosing pump. Irrespective of the phase the installation is in, these incoming pulses will be forwarded to the output.

The water meter function (see § 4 "Input functions" on page 11) as well as the flow pulse function (see § 14.3 "Output functions" on page 29) need to be activated.

The length of the outgoing pulses is adjustable (see § 14.3.5 "Flow puls" on page 31).

6.7 Regeneration output

This output indicates whether the installation is in the "regeneration" phase or not.

The function should be activated (see § 14.3 "Output functions" on page 29).

The output is activated for the regeneration of the cation as well as the regeneration of the anion filter. In case a filling program is activated, the output will also be activated during this filling program.

6.8 Alarm

In case the alarm output function is activated (see § 14.3 "Output functions" on page 29) for several situations it can be programmed whether the alarm relay should be activated (see § 14.10 "Alarm output" on page 41)

The deactivation of the alarm relay takes place by pressing the "RESET" key .

After the cause of the alarm has been remedied, this key can be pressed again to remove the message from the LCD screen.

ATTENTION: to remove the message "maintenance" from the LCD screen, you need to contact your supplier.



7 Regeneration start conditions

The installation can be switched to the regeneration phase based on one or more of these situations. In this chapter we discuss these situations.

Possible situations:

- Conductivity too high
- Volume (water meter)
- Interval period
- Real time clock
- External start via digital input function "RS"
- Manual mode

7.1 Conductivity

By means of conductivity measuring, regeneration can be started, if the maximum limit value of the measured conductivity is activated and exceeded.

When no automatic regeneration is required, the alarm relay will be activated automatically and a message appears on the display. It can be set in this situation whether the service valve will be opened or closed.

When a regeneration demand appears after this, through one of the other conditions (example given on volume), regeneration will still start if automatic regeneration is permitted.

Upon activating the rinsing function after the set delay time the rinsing valve will be opened during a rinsing time to be set.

If the conductivity is ok again within this rinsing period, the rinsing valve will be closed immediately and the installation continues in the normal service status.

When the alarm is activated because the conductivity is exceeded, the alarm relay as well as the message on the display will be deactivated.

The anion filter will be regenerated as soon as the number of set regenerations of the cation filter has taken place.

7.2 Volume

By means of a pulse water meter the quantity of water processed by the installation can be kept up to date. By entering the capacity of the cation filter and the number of times the water meter gives out a pulse, it can be determined when the filter is exhausted. In step 7.10 it can be indicated whether the regeneration should be started if the treated quantity of water is equal to the stated capacity of the filter.

The anion filter will be regenerated after the set number of regenerations of the cation filter has taken place.

7.3 Interval period

An interval period can be activated after which the cation filter is regenerated.

See also § 14.7.3 "Interval" on page 38.

After regenerating the cation filter this interval counting device will be reset.

The anion filter will be regenerated after the set number of regenerations of the cation filter has taken place.



7.4 Real time clock

Based on the Real time clock two periods of time can be programmed on which a regeneration can be started. The periods of time can be activated on the required days of the week. See also § 14.7.5 "Clock" on page 39

The anion filter will be regenerated after the set number of regenerations of the cation filter has taken place.

7.5 External start


Via the input "external start" regeneration can be started by remote control. The input is blocked during regeneration and liberated again after regeneration and the expiring of the set "ignore" time (step 4.20).

Attention: The "ignore" time is also activated after a power loss to wait for fresh measuring of a control device contiguously.

See also § 4.5 "External regeneration start" on page 12, § 14.4 "Input functions" on page 32 and 14.7.4 "External contact" on page 38.

The anion filter will be regenerated after the set number of regenerations of the cation filter has taken place.

7.6 Manual mode

Regeneration can always be started by pressing the  key.

If the regeneration is still blocked (see § 8 "Regeneration limitations" on page 18) regeneration can still be started by pressing this key again. The limitations will then be ignored.




8 Regeneration limitations

Regeneration or regeneration start can be blocked under certain circumstances.


The following blocks are possible:

- input "wait" (WA)
- Prohibited regeneration (see also § 14.8.1 "Prohibited regeneration" on page 40).
chemical level switch (see also § 14.4.2 "Level switch chemical tank cation" on page 33 and § 14.4.3 "Level switch chemical tank anion" on page 33)

The block could alternatively be removed by pressing the  key for approx. 4 seconds.

8.1 Input "Wait" (WA)

The input "wait" (WA) is monitored at the beginning as well as during the regeneration.

If the input is activated at the time the regeneration wants to start (i.e. after a possible filling program has finished), then regeneration will not start and is paused until the input is not active anymore or until a start is activated by means of the  key. During this situation the filter will be switched into the "stand by" (SP) phase.

If the regeneration had started already upon activating this input the remaining regeneration time will not be counted. These outputs for the filter remain in an unchanged position.

This input can e.g. be used to indicate that there is insufficient pressure to guarantee a good service of the regeneration.

8.2 Prohibited regeneration

The function "Prohibited regeneration" is monitored upon starting the regeneration of the cation filter. In case a filling program is activated, this monitoring will take place before the chemical tank is filled.

During the Prohibited regeneration the filter will be switched onto "stand by" (SP) phase or in the "service" (SV) phase. Whether the service valve remains open or closed during this situation depends on the setting.

If this situation e.g. coincides with a situation in which a closed service valve is required (e.g. if the wait input is activated), the service valve will be closed.

Once regeneration has started it will not be interrupted by this function.

8.3 Chemical level switch (RCC / RCA)

The input "chemical level" (RCC or RCA) can be used to indicate if sufficient chemicals are available to carry out a good regeneration.

This could alternately be done in combination with a filling program (via the refuelling valve).

If the input is active at the start of regeneration, regeneration will not be started and is paused until sufficient chemicals are present or until a start is activated by pressing the key. During this situation the filter will be switched into the "stand by" (SP) phase.

If regeneration has started already, this input will not be monitored again until the following regeneration starts.











9 General control

The control and programming of this control is executed by means of the 6 keys.

Below you will find an explanation of the general screen lay out, the meaning of various keys and an explanation of general control during the programming.

9.1 Main screen

In the main screen the various keys have a certain meaning, as follows:

-  = Manual start regeneration
-  = On / off installation (service / stand by)
-  = Access / exit clock setting
-  = Reset alarm
-  = Require information
-  = In combination with  access to programming
In combination with  access to language setting

Additionally various other key combinations as will be discussed in § 10 "Manual mode of the installation" on page 20.

9.2 Menus

If one of the menus is activated (clock, language or programming) the indications in the grey bar above the blue keys are valid:

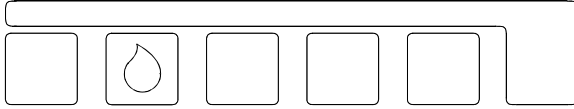
- ▶ = moving the cursor to the next setting
- ▼ = next setting
- ▲ = last setting
- # = raising or changing the number resp. indication where the cursor is placed under.





10 Manual mode of the installation

It is possible to access the installation process manually.
Below, the options are stated.

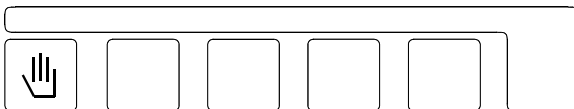
10.1 Switching the installation on / off




The installation can be switched on / off manually (“service” and “stand by”) by pressing key .
In case the function “level switch storage tank” is activated and the level in the storage tank is insufficient, the installation will be switched off after all. The installation will be switched on when the key  is pressed again.

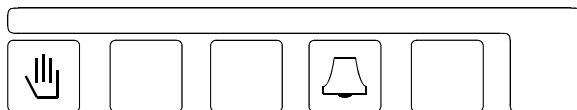
The level switch function cannot be switched on manually when there is enough level in the storage tank. In this case, during the key pressing, it will show the tank is full.



10.2 Manually operated start regeneration



Regeneration can be started manually from the “stand by”, “service” phase and during waiting for regeneration by pushing the  key. .

10.3 Immediately terminating regeneration



Press the  and  keys simultaneously. Regeneration will be interrupted after 2 seconds and be set in service position.

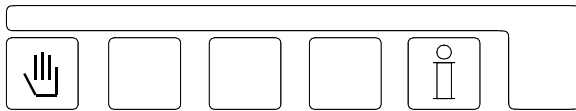
If regeneration of the cation filter is interrupted this regeneration will not count in the regeneration rate with the anion filter.



Attention: multi-stage valves without an automatic reset connection to the service position (the so called “home switch”) remain in regeneration position and are not synchronically switched with the control.

Attention: If a regenerating chemical has already been sucked through, the filter should be rinsed before commissioning.



10.4 Fast regeneration



Press the  and  keys simultaneously. After two seconds the counting device of the regeneration program switches from minutes to seconds.

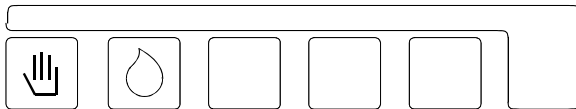
The activated “fast regeneration” only applies to the actual regeneration phase. In case of a following regeneration phase the counting device will run in minutes again.

If the electrical control is set on pulse control the “Fast regeneration” function can only then be activated after the pulse has been given.



Attention: If you want to walk through the various regeneration phases, then wait two to three minutes after every phase until all valves have reached their new position.

Attention: If a regenerating chemical has already been sucked through, the filter should be rinsed before initial starting.

10.5 Regeneration without counting device reset

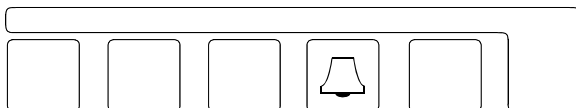



For maintenance purposes it may be necessary to monitor the regeneration program without having the values of the impulse counting device reset and without calculating the filter capacity again.

Push the  and  keys simultaneously. Regeneration will start after 2 seconds. The cation and anion filter will go through the regeneration program irrespective of the set regeneration rate. An alternatively activated filling program will be passed through as well.

After regeneration has finished the counting device of the remaining capacity of the cation filter as well as the number of regenerations of the cation filter will be unchanged.

10.6 Reset alarm



If an alarm indication and / or alarm output is activated then this can be reset by pressing the  key. If an alarm output is activated the output will first be deactivated.


The alarm message disappears when the cause of the alarm has been cancelled and the key has been pressed again.

In some cases the output is automatically deactivated and the message on the LCD display disappears automatically as well.

(See § 15 “Possible error messages” on page 42).



11 Information request

Via the information menu several data can be retrieved, such as the software version, the service telephone number, the status of the inputs and outputs, the maintenance interval (if programmed). Via the  key the whole information menu can be walked through.

11.1 Software version

```
Softwareversion
ES2070CA 1.00.00
```

The software is kept up-to-date in the factory on a regular base. If necessary changes take place in order to adjust the product to new insights and requirements. On the display the version of the installed software is displayed.

11.2 Regeneration times cation

```
Reg.time Ca [min]
Σ 95m
```

Left below the total time of regeneration is displayed
Right below the remaining time of a possible regeneration is displayed

11.3 Regeneration times anion

```
Reg.time An [min]
Σ 95m
```

Left below the total time of regeneration is displayed
Right below the remaining time of a possible regeneration is displayed

11.4 Regeneration limitations

```
No Reg ---
Int Rg -
```

NoReg 16:00 – 18:00 / Regen 16:00 – 18:00

If a time period was set in the basic programming in the 3rd step in which the regeneration is either blocked or permitted, this time period is displayed.

Otherwise the display shows: NoReg —

IntRg 72

If the interval start was set in the basic programming in the 4th step, the time interval would be displayed in hours. Otherwise the display shows: IntRg -.

11.5 Filter capacity

```
Unity capacity
1800m3
```

The period capacity a filter produces in between two regenerations is displayed.

11.6 Softened water production

Treated water
10.0m3

The total amount of softened water production is displayed.

11.7 Status inputs

Input 1
WM- RCC- RCA-

Input 2
FU- WA- RS-

The actual switch positions of the inputs are displayed. A "I" next to the code means: input function active, a "-" means: input function not active.

WM = Water meter

RCC = Level chemical tank cation

RCA = Level chemical tank anion

FU = Level storage tank

WA = Wait

RS = Regeneration start

The input functions WM, WA and RS are active, when they are bridged (closed).

The input functions RCC, RCA and FU are active, when they are not bridged (opened).

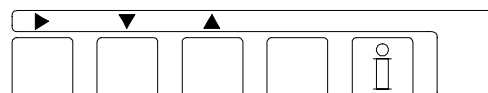
11.8 Status outputs

123456789ABCDEF
-- | | - - - - - - - - | |

The actual switch positions of the outputs are displayed. Every relay is assigned a number. (see page 47 "Wiring diagram ES2070 CA"), a horizontal line "-" underneath a number means: relay not energized. A vertical line "I" means: relay energized.

11.9 Service number

Service number
0031 73 443755



A service telephone number is shown. The number can be adjusted here as well.

Change telephone number:

Select number: ▶

Mark down: ▼

Mark up: ▲

11.10 Maintenance

Maintenance
50000m3 30m3

A maintenance interval can be programmed. This counting device keeps track of the number of m³ softened water between the services. When this interval is not activated ("No") will be displayed.

Otherwise the number of m³ softened water that is produced after the last service is indicated.

11.11 Relation

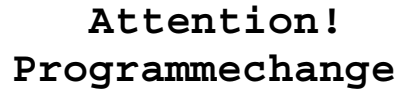
Relation
1:1/0

On the display the set regeneration relation (in this Case 1:1) is shown and next to it the number of regenerations of the cation filter after the last regeneration of the anion filter.



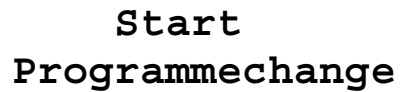
12 Change set language

Press the “enter” key and keep it pressed for approx. 5 seconds. The following text shows on the display:



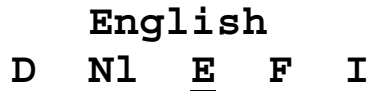
Attention!
Programmechange

and after 5 seconds the text:



Start
Programmechange

Press, after these 5 seconds, the “#” key as well and the set language is activated. Both keys can be released. The display shows:



English
D Nl E F I


You can change the language by pressing the ► key.

The language setting can be left by pressing the “enter” key again. When no key is pressed for approx. 2 minutes, you automatically leave the setting.

You can choose from the following languages: German, Dutch, English, French and Italian.




13 Set Clock

Press the  key. The bottom line shows the actual time.

```
Current time
Mo 12:00
```

If you would like to change the displayed time, you move the cursor underneath the day or the number you would like to adjust by using the **▶** key.

You can change the day or mark up by using the “#” key.

You can leave the time setting by pressing the key  again.

When no key is pressed for approx. 10 seconds, you automatically leave the setting.

14 Programming

In the following chapters is described how to program the control.
 A total overview of all menu options can be found in § 17 “Fill in list programming” on page 46.

Attention:
Some windows cannot be accessed because of setting(s) made before.

14.1 Conductivity measuring

Step no: 1.1
 Weergave LED J/N

The conductivity can either take place on the LCD display or on the LED display.
 Attention! When the capacity display is also activated the messages appear every 2 seconds.

Step no: 1.2
 TDS Y/N

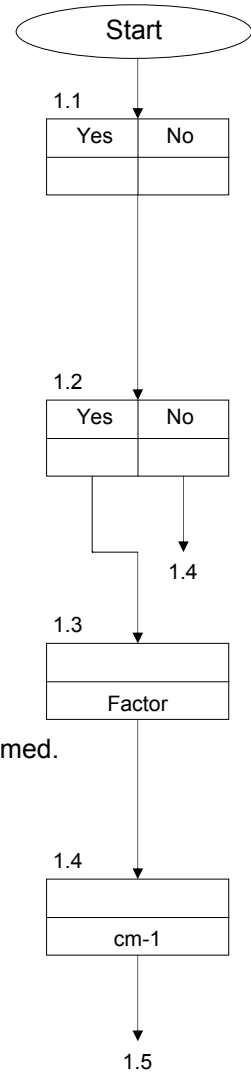
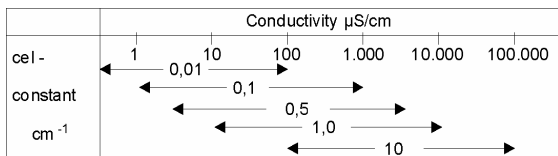
The conductivity can be displayed in $\mu\text{S/cm}$ or in ppm (TDS).

Step no: 1.3
 TDS Factor 0.75

In case the display should be displayed in rpm a conversion factor can be programmed.

Step no: 1.4
 Constant 0.10

In accordance with the conductivity of water to be measured a sensor with an adjusted cell constant should be chosen. A cell constant of 0.01 cm^{-1} up to 10.00 cm^{-1} inclusive for the conductivity meter can be programmed.





Step no:	1.5
Factor	1.0<u>0</u>

Expressing the conductivity takes place at a water temperature of 25 °C. Deviant temperatures are corrected manually or, in case a temperature sensor is used, automatically.

Other measuring errors, originating from e.g. polarisation, conductor resistances or cable capacities can be compensated here by entering a correction factor - at least for a certain range. A conductivity correction factor of 0.10 to 5.0 can be entered.

Determination of the conductivity correction factor:

Take a water test and measure the conductivity with a calibrated conductivity meter: **calibration value**

Write down the read out of the control: **measuring value**

The correction factor to be entered is calculated thus as follows:

$$\frac{\text{Calibration value}}{\text{Measuring value}} = \text{Correction value}$$

Step no:	1.6
Limit Min.	Y/<u>N</u>

Here conductivity values can be monitored that are below a preset limit value.

Step no:	1.7
Value Min.	1.0<u>0</u>

An electrical interruption to the conductivity sensor, electrical system errors or air near the sensor can erroneously lead to far too low a conductivity being displayed.

For monitoring objection a limit value of 0.10 – 999.99 µS/cm can be entered.

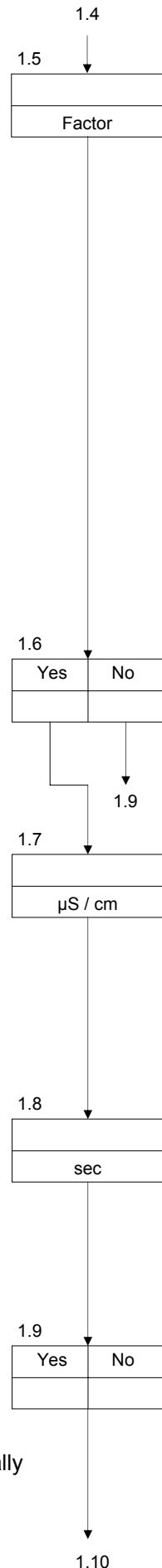
Step no:	1.8
Delay	6<u>0</u>s

After a programmable delay time of 1 – 9999 seconds appears on the LCD display the message “conductivity too low” when the conductivity value is below the set minimum.

Step no:	1.9
Limit Max.	<u>Y</u>/N

Here conductivity values can be monitored, which are above a preset limit value.

ATTENTION! If no upper limit value is entered, regeneration does not start automatically either because of a too high conductivity.





Step no: 1.10
Value Max 100.00

Through a change in the quality of supply water, the water conductivity can be modified. For safety, a marginal value of a MAX of 0.1 to 999.99 $\mu\text{S}/\text{cm}$ can be set. ATTENTION! This marginal value must lie above the minimum marginal value.

Step no: 1.11
Delay 10s

After a programmable delay time of 1 – 9999 seconds on the LCD display a message appears “conductivity too high” when the conductivity value is above the preset maximum value.

14.2 Temperature measuring

The control is equipped, as standard, with a temperature meter. A manual temperature conversion can also be carried out.

Step no: 2.1
Temp.Manual Y/N

Indicate if the manually set temperature should be used for converting the conductivity to the values at 25 °C or if the measured value should be taken.

Step no: 2.2
Temperature 25°C

Enter the temperature manually (1-99 °C).

Step no: 2.3
Display LCD Y/N

Indicate if the measured temperature should be shown on the LCD display.

Step no: 2.4
Limit Max. Y/N

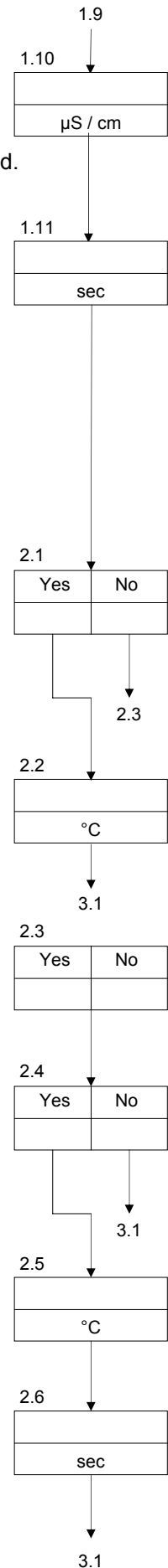
Here you can set the monitoring of the maximum water temperature.

Step no: 2.5
Value Max 80°C

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

Step no: 2.6
Delay 60s

After a programmable delay time of 1 – 999 seconds on the LCD display the message “temperature too high” appears if the temperature value is above the preset maximum value.



14.3 Output functions

In the following steps special output functions can be activated.

Step no:	3.1
Alt Imp <u>SV</u>	

In the above step can be indicated if the cation and anion are controlled via individual valves (SV), by means of a control valve that can be operated through pulses (Imp) or by means of a control valve that can be operated via switching control (Alt).

In the following steps the output functions can be set for the outputs OUT9 up to OUT15 including. The used abbreviations have the following meaning:

- | | | |
|------------------------------|-----------------------------------|------------------------|
| <i>RV = Rinse valve</i> | <i>FCC = Filling valve cation</i> | <i>- = No function</i> |
| <i>CP = Circulation pump</i> | <i>FCA = Filling valve anion</i> | |
| <i>FP = Flow pulse</i> | <i>RE = Regeneration-output</i> | |
| <i>VA = Individual valve</i> | <i>AL = Alarm</i> | |

Step no:	3.2
RV VA =	

Select the output function for OUT9.

Step no:	3.3
FCC VA =	

Select the output function for OUT10.

Step no:	3.4
FCA VA =	

Select the output function for OUT11.

Step no:	3.5
CP VA =	

Select the output function for OUT12.

Step no:	3.6
FP VA =	

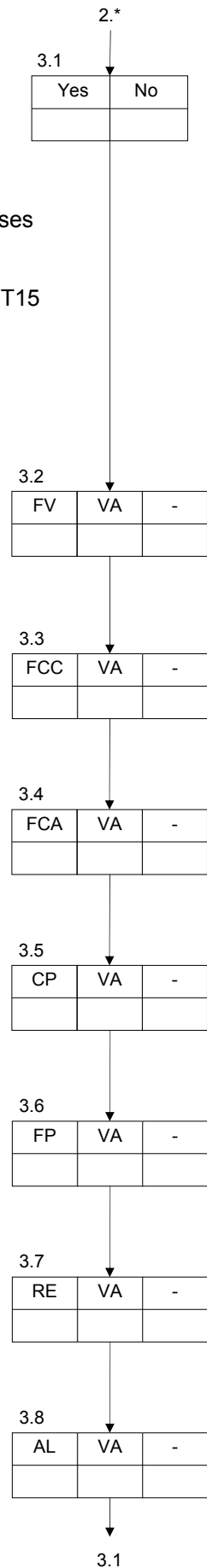
Select the output function for OUT13.

Step no:	3.7
RE VA =	

Select the output function for OUT14.


Step no:	3.8
AL VA =	

Select the output function for OUT15.




14.3.1 Refuelling valve Cation

Step no: 3.20
Filltime Ca. 20m

Enter the filling time for filling the chemical tank of the cation filter. (1-999 minutes). When the level switch for this tank is activated (step 4.2) the filling program will be interrupted as soon as the level is sufficient. Should the level switch still show insufficient level after the filling time, an error message will follow and the installation waits until the filling starts again manually via the  key. (see also § 6.4 “Refuelling valve” on page 14)

14.3.2 Refuelling valve Anion

Step no: 3.25
Filltime An. 20m

Enter the filling time for filling the chemical tank of the cation filter. (1-999 minutes). When the level switch for this tank is activated (step 4.2) the filling program will be interrupted as soon as the level is sufficient. Should the level switch still show insufficient level after the filling time, an error message will follow and the installation pauses until the filling starts again manually via the  key. (see also § 6.4 “Refuelling valve” on page 14)

14.3.3 Rinsing valve

Step no: 3.30
Rinse time 30s

Enter the rinsing time if the conductivity rises above the preset maximum limit value (after the set delay time) see § 14.1 “Conductivity measuring” on page 26).

14.3.4 Circulation pump

Step no: 3.40
Service (CP) Y/N

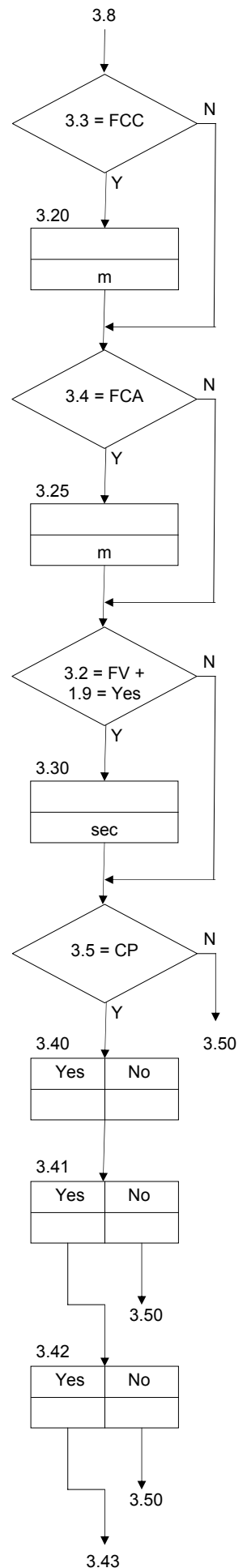
Indicate if the circulation pump should be switched on during service (continuous).

Step no: 3.41
Standby (CP) Y/N

Indicate if the circulation pump should be switched on during stand by.

Step no: 3.42
CP Interval Y/N

If the circulation pump should be switched on during stand by here can be entered if the pump should be switched on continuously (No) or with intervals (Yes).



Step no:	3.43
Interval	2 <u>0</u> m

Enter the interval period the pump will be switched off during stand by (1-9999 min).

Step no:	3.44
Circ.time	1 <u>5</u> m

Enter the interval period the pump will be switched on during stand by (1-9999 min).

14.3.5 Flow pulse

Step no:	3.50
Pulse per.	1, <u>0</u> s

Every impulse of the water meter is passed on to the relay in a 1:1 ratio. These impulses can be used for driving a dosing pump, a dosing control or a flow control switch.

The duration of each impulse can be set from 0.2 to 999.9 seconds.

Water meter impulses which follow each other closely are registered and passed on with intervals of 0.5 seconds after one other.

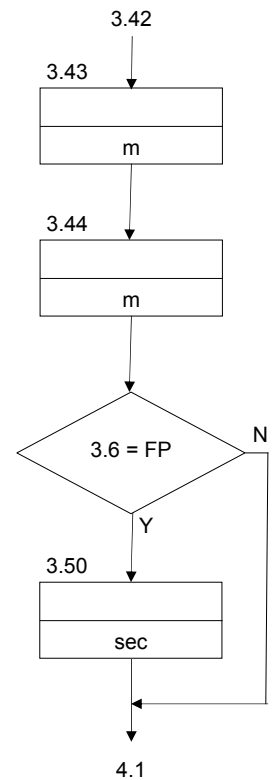
14.3.6 Regeneration output

The "regeneration" function does not need to be further programmed.

The output is activated if one of the two filters is in regeneration.

14.3.7 Alarm

In program step 10 can be set in which situations the alarm output should be activated.



14.4 Input functions

In the next steps the input functions can be activated and set for the inputs. The abbreviations used have the following meaning:

- WM* = Water meter
- RCC* = Level chem. tank cation
- RCA* = Level chem. tank anion
- = No function
- FU* = Level storage tank
- WA* = Wait
- RS* = Regeneration start

Step no:	4.1
WM	-

Activate the water meter function by positioning the cursor under "WM".

Step no:	4.2
RCC	-

Activate the level switch function in the chemical tank of the cation filter.

Step no:	4.3
RCA	-

Activate the level switch function in the chemical tank of the anion filter.

Step no:	4.4
FU	-

Activate the level switch function in the storage tank.

Step no:	4.5
WA	-

Activate the function "wait".

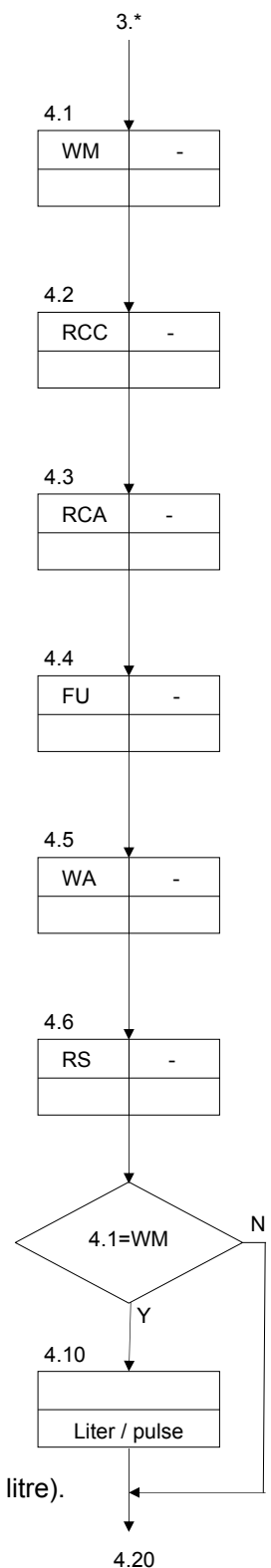
Step no:	4.6
RS	-

Activate the function "regeneration start"

14.4.1 Water meter

Step no:	4.10
Liter/Imp.	1001

By means of an impulse water meter the take-up of treated water is determined. Enter the number of litres the water meter responds to by giving an impulse (1-9999 litre). Upon reaching the preset amount (step 5.1), regeneration can be started. This is adjustable in step 7.10. In the LED display, it is indicated how much water can still be taken.





14.4.2 Level switch chemical tank cation

There is no programming to be done for the level switch in the chemical tank of the cation filter. The input has a fixed delay of 1 second and a high level is detected if the voltage-free contact on the input is closed.

14.4.3 Level switch chemical tank anion

There is no programming to be done for the level switch in the chemical tank of the anion filter. The input has a fixed delay of 1 second and a high level is detected if the voltage-free contact on the input is closed.

14.4.4 Level switch storage tank

There is no programming to be done for the level switch in the chemical tank. The input has a fixed delay of 1 second. Switching off the installation (phase “stand by”) will take place immediately. A high level is detected if the voltage-free contact on the input is opened.

Switching off the installation (phase “stand by”) takes place immediately. A high level is detected if the voltage-free contact on the input is open.

14.4.5 Input “wait”

There is no programming to be done for the “input “wait””. The input has a fixed delay of 1 second. The input function is active if the contact is closed.

14.4.6 Regeneration start

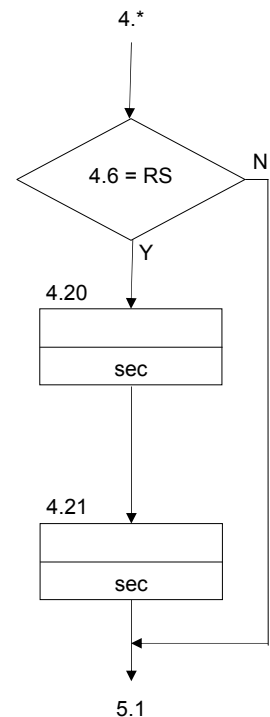
Through the input “RS” a regeneration can be started by remote control. In the following steps the delays can be set for this input function.

Step no:	4.20
Reg.delay 1	60 <u>0</u> s

After regeneration the input “regeneration start” can be ignored for a certain time .
Enter the required time (0-999 sec) here.

Step no:	4.21
Reg.delay 2	1 <u>0</u> s

Enter the delay time for the input function (0-999 sec).





Step no: 5.5
Pulse per. 1: 48s

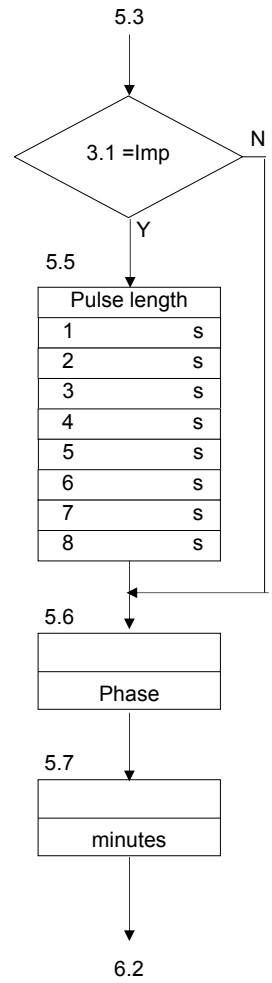
If a central control valve with pulse control is used, the duration for each phase of the pulse can be entered (1-999 sec). The last pulse serves to switch the control valve from the last regeneration phase to the service position. This last pulse duration only needs to last a couple of seconds, so the "home switch" can return to the correct service position.

Step no: 5.6
Suction phase 2

In this step can be entered during which phase (1 or 2) the suction valve for sucking through the chemicals for the cation filter should be open. This suction valve should be connected on output OUT4.

Step no: 5.7
Suction time 20m

Enter the time the suction valve should be open (1-999 min.).



14.6 Settings anion filter

In the next steps parameters can be set with regards to the anion filter

Step no:	6.2
Stages	3

Enter the number of regeneration steps of the anion filter (1-8).

Step no:	6.3
Time phase ₁ :	15m

Enter in this program step, in accordance with the regeneration phase, the required duration of the relevant regeneration phase. A value between 1 and 999 minutes may be entered.

An.	123456789
SV	-----x

An.	101112131415
SV	x x x x x x

When individual valves are used (step 3.1 = SV) per phase can be entered, which valves need to be open. In the first line the filter (an.) and the outputs (1-9 + 10-15) are indicated. In the second line the phase is indicated and under the numbers 1-9 the status of the relevant output in this phase.

The phase indication is as follows:

SV = Service stand,

SP = Stand by,

HO = Wait position during regeneration, 1-8 = Regeneration phase 1-8).

The outputs 9 up to 15 included are only adjustable if the function "VA" (valve) is set for the relevant output in step 3.x. If the relevant outputs are set differently, this is indicated by an "x".

The following is applicable with regards to the outputs:

"|" relay of the relevant output is energized.

"-" relay not energized.

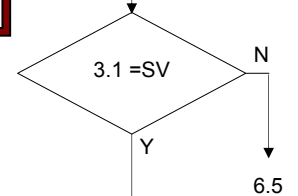
The relay should be energized, if this needs to be energized for anion and / or cation filter. Energizing the relay has precedence over not energizing a relay.

5.4 / 5.7

6.2
Stages

6.3

Regeneration times	
1	m
2	m
3	m
4	m
5	m
6	m
7	m
8	m



6.4

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SV															
SP															
HO															
1															
2															
3															
4															
5															
6															
7															
8															

6.8



Step no: 6.5
Pulse per. 1: 48s

When a central control valve with pulse control is used, for each phase the duration of the pulse can be entered (1-999 sec). The last pulse serves to switch the control valve from the last regeneration phase to the service position. This last pulse duration only needs to last a couple of seconds, so the "home switch" can return to the correct service position.

Step no: 6.6
Suction phase 2

In this step can be entered during which phase (1 or 2) the suction valve for sucking through the chemicals for the cation filter should be open. This suction valve should be connected on output OUT8.

Step no: 6.7
Suction time 20m

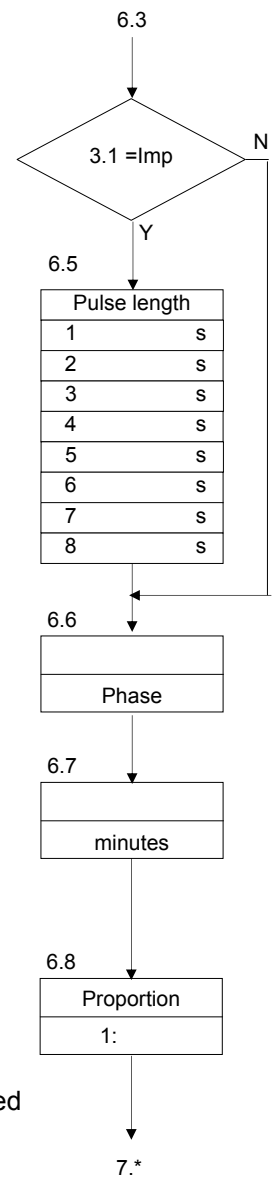
Enter the time the suction valve should be open (1-999 min.).

Step no: 6.8
Relation 1:1

Because the redress life of the anion filter can be longer than that of the cation filter a rate may be entered (1-9).

Example

1:2 signifies the anion filter is regenerated after the cation filter has been regenerated twice.



14.7 Regeneration starts

In the next phases, which situation(s) an automatic regeneration should be started can be entered.

An automatic regeneration can take place based on:

- Conductivity measuring
- Water meter
- Interval period
- External contact
- Real time clock

14.7.1 Conductivity

Step no:	7.1
Reg.start CD	<u>Y</u> /N

Indicate whether the regeneration should be started automatically if the conductivity during the set delay time is above the set limit value.

This step is only when the monitoring of the maximum conductivity is activated (step 1.9).

14.7.2 Water meter

Step no:	7.10
Watermeter	<u>Y</u> /N

Indicate whether the regeneration should be started automatically if the cation filter has treated the set amount (step 5.1) of water.

This step is only accessed if the water meter function is activated (step 4.1).

14.7.3 Interval period

Step no:	7.20
Interval	<u>Y</u> /N

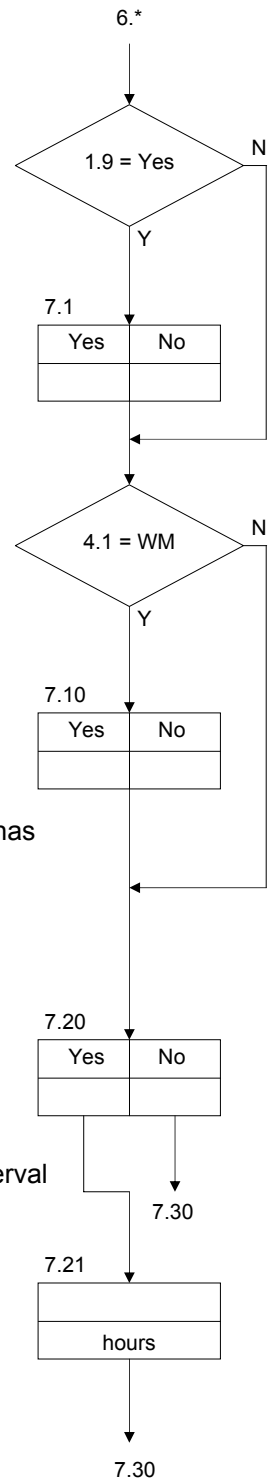
Indicate whether the regeneration should be started automatically after a certain interval period.

Step no:	7.21
Period	7 <u>2</u> h

Enter the interval period (1-999 hr).

14.7.4 External contact

No further programming is used for this other than the activation of the function and the setting of the delays as seen in step 4.



14.7.5 Clock

Step no:	7.30
Timestart	Y/<u>N</u>

Indicate if the regeneration should be started automatically on (a) certain day(s) and time(s) based on a Real time clock. Two different points in time can be programmed.

Step no:	7.31
S_M-T-W-T-F-S-	

Select the days on which regeneration should start at the following time. (“-“: day is not selected, “|“: day is selected).

Step no:	7.32
Starttime	00:30

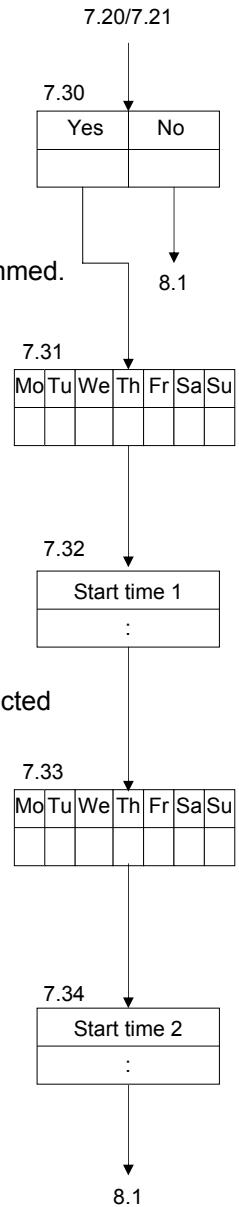
Enter the time on which regeneration should start, (in the previous step), on the selected days.

Step no:	7.33
S_M-T-W-T-F-S-	

Select the days on which on the following time regeneration should start. (“-“: day is not selected, “|“: day is selected).

Step no:	7.34
Starttime	05:00

Enter the time on which regeneration should start, (in the previous step), on the selected days.




14.8 Regeneration blocks

In the following steps it can be entered based on which situation(s) automatic regeneration should be blocked.

An automatic regeneration can be blocked by;

- Prohibited regeneration (Real time clock)
- Input wait
- Level chemical tank (cation / anion)

ATTENTION: - A possible clock based start should NOT fall within the block!

- In case an automatic regeneration is blocked the regeneration can always be manually started by means of the  key.

14.8.1 Prohibited regeneration

Step no: 8.1
Time delay B/A/N

Regeneration can be started at any time of the day. Often regeneration during production time is not required, e.g. while the water pressure for regeneration is not sufficient.

B = During the stated days (step 8.2) and times (step 8.3 and 8.4) a regeneration is blocked.

A = During the stated days (step 8.2) and times (step 8.3 and 8.4) a regeneration is blocked.

N = No time control on a regeneration start.

Step no: 8.2
S | M | T | W | T | F | S |

Select the days the time control on the regeneration should be activated.

Step no: 8.3
Time1 00:30

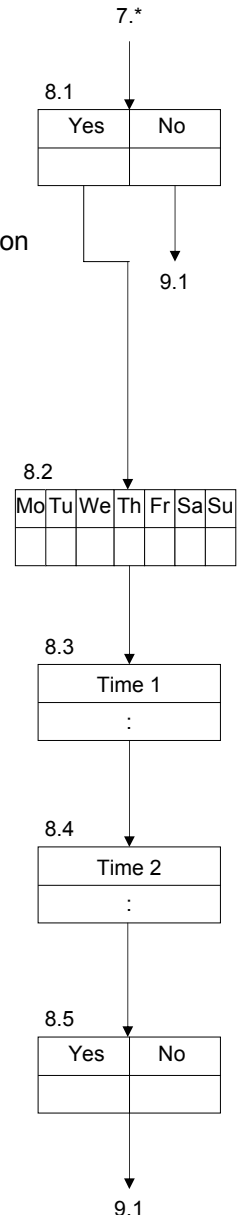
Enter the time as per when the regeneration is blocked (B) / permitted (A).

Step no: 8.4
Time2 05:00

Enter the time as per when the regeneration is permitted (B) / blocked (A) again.

Step no: 8.5
Main valve onY/N

Indicate whether the service valve needs to remain open till the time of regeneration.



14.8.2 Input “Wait”

No further programming is needed, apart from activating the function as seen in step 4.

14.8.3 Level chemical tank (cation / anion)

No further programming is needed, apart from activating the function as seen in step 4.

14.9 Maintenance

Step no:	9.1
Maintenance	Y/<u>N</u>

Indicate whether, after a preset quantity of water a message should be given, that maintenance should be carried out to the installation.
Subsequently, in step 10 can be set if the alarm relay should be activated as well.

Step no:	9.2
Interv.	50000m³

Enter the maintenance interval (1 - 999.999 m³).

14.10 Alarm output

In the following program steps can be indicated in which situation(s) the alarm output should be activated. A horizontal line (“-”) means that the relevant situation does not lead to activation if the alarm output function is not activated (step 3.8)

Step no:	10.1
PF -MI -MA -TM -	

Select in which situation the alarm output should be activated.

- PF = Power failure
- MI = Conductivity below minimum limit value
- MA = Conductivity above maximum limit value
- TM = Temperature above maximum limit value

Step no:	10.2
DY -WA -RCC-RCA-	

Select in which situation the alarm output should be activated.

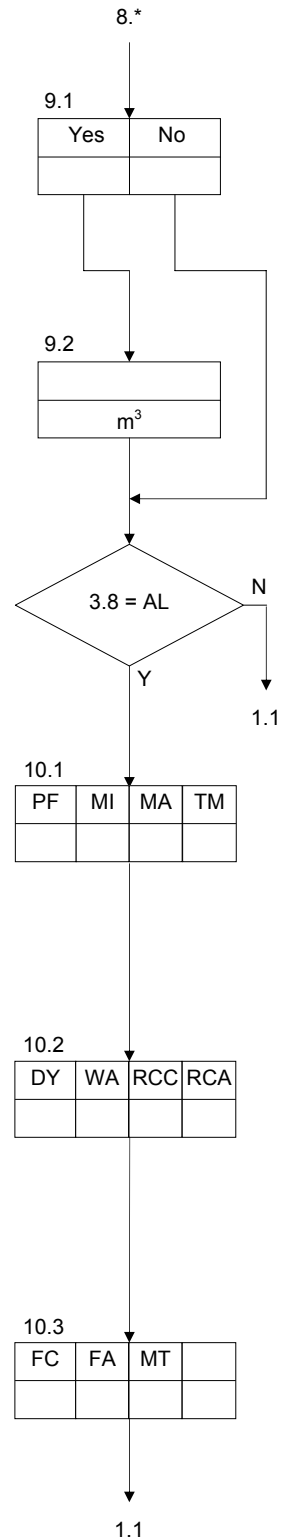
- DY = Prohibited regeneration
- WA = Input 'wait'
- RCC = Level chemical tank cation
- RCA = Level chemical tank anion

Step no:	10.3
FC -FA -MT -	

Select in which situation the alarm output should be activated.

- FC = Failure during filling up chemical tank cation
- FA = Failure during filling up chemical tank anion
- MT = Maintenance

(see § 6.8 “Alarm” on page 15)





15 Possible error messages

Depending on the equipment and programming of the control, various signals can be given that can be signalled by the alarm output and be shown in the LCD display

The alarm outputs are programmable. This means it can be indicated which messages are passed on by the alarm output (see § 14.10 "Alarm output" on page 41).

The alarm function can be activated in step 3.7 (see § 14.3 "Output functions" on page 29).

In case of an error message this will appear in the LCD display and, if the alarm function is activated for the relevant situation, the alarm output will be activated.


(see § 6 "Output functions" on page 15)


Overview of possible alarm indications

15.1 Minimum conductivity

**Conductivity
too low**

The message "conductivity too low" shows when the measured conductivity has been under the set minimum limit value for a certain time.

The possibly activated alarm output can be switched off again by the  key.

The message on the LCD display disappears when the conductivity has passed the set limit again and the  key is pressed again.


Possible causes

Change of water quality, air in the measuring cell or an electrical interruption in the wiring between measuring cell and control.

15.2 Maximum Conductivity

**Conductivity
too high**

The message "conductivity too high" appears when the measured conductivity has been above the set maximum limit value for a certain time and no automatic regeneration start has been set.

The possibly activated alarm output can be switched off again by the  key or is automatically switched off when the regeneration starts.


Possible causes:


Change of water quality, filter(s) exhausted or a short circuit of the measuring cell.

15.3 Maximum temperature

**Temperature
too high**

The message "temperature too high" appears when the measured temperature has been above the maximum limit value for a certain time.

The possibly activated alarm output can be switched off again by the  key.

The message on the LCD display disappears when the temperature is below the set limit value again and the  key is pressed.

15.4 Signal 'wait'

**Signal
Wait**

The message "signal wait" appears when the input "wait" is activated at the moment of regeneration start or during regeneration.

If the alarm output is activated due to the input wait, then this can not be switched off manually. The alarm relay and the message on the display are automatically switched off when the input is no longer active.

15.5 Filling up regenerating chemicals cation

**Refill
Regenerant (Ca)**

The message "fill up regenerating agent (ca)" appears when the level in the chemical tank of the cation filter is insufficient and no filling program (refuelling valve function of the cation filter) is activated.

If the alarm output is activated due to the input function this output can be switched of manually. The alarm relay and the message on the display are automatically switched off when the input is no longer active.

15.6 Filling up regenerating chemicals anion

**Refill
Regenerant (An)**

The message "fill up regenerating agent (an)" appears when the level in the chemical tank of the anion filter is insufficient and no filling (refuelling valve function of the anion filter) is activated.

If the alarm output is activated due to the input function this output can be switched of manually. The alarm relay and the message on the display are automatically switched off when the input is no longer active.

15.7 Prohibited regeneration

**Regeneration
Prohibited**

The message "regeneration Prohibited" appears when the function "Prohibited regeneration" is activated and a generation is started within the time that no regeneration is to take place.

15.8 Signal 'Fill failure Cation'

**Signal
Fill failure Ca.**

The message "signal filling error cation" appears when the level in the chemical tank of the cation filter is insufficient, after the set filling time has expired.

If the alarm output is activated due to the input function this output can be switched off manually. The alarm relay and the message on the display are automatically switched off when the input is no longer active.

15.9 Signal 'Fill failure Anion'

**Signal
Fill failure An.**



The message "signal filling error anion" appears when the level in the chemical tank of the anion filter is insufficient, after the set filling time has expired.

If the alarm output is activated due to the input function this output can be switched off manually. The alarm relay and the message on the display are automatically switched off when the input is no longer active.

15.10 Power failure

**Signal
Power failure**


The message "power failure" appears when the control is switched on again and the alarm output is programmed for the "power loss" situation.

If the alarm output is activated this output can be switched off manually (). The message on the LCD display disappears when the  key is pressed again.

15.11 Maintenance

**Signal
Maintenance**

The message "maintenance" appears when the installation has produced the preset quantity of water, after which a service should be carried out.

If the alarm output is activated this output can be switched off () manually.

The message on the LCD display can only be switched off by a professional maintenance company. (see § 6 "Output functions" on page 15)



16 Frequently asked questions

Question:

The conductivity is not displayed correctly

Answer:

- Check the setting of the cell constant (step 1.4), correction factor (1.5)
- Is the temperature setting correct (step 2.*)?
- Are the correct connections of the measuring cell used?
- Is the measuring cell connected to input CC1?
- Is the position of the measuring cell correct (completely under water)?
- Are there any air bubbles in the system and in particular near the measuring cell?
- Are the measuring rods clean?



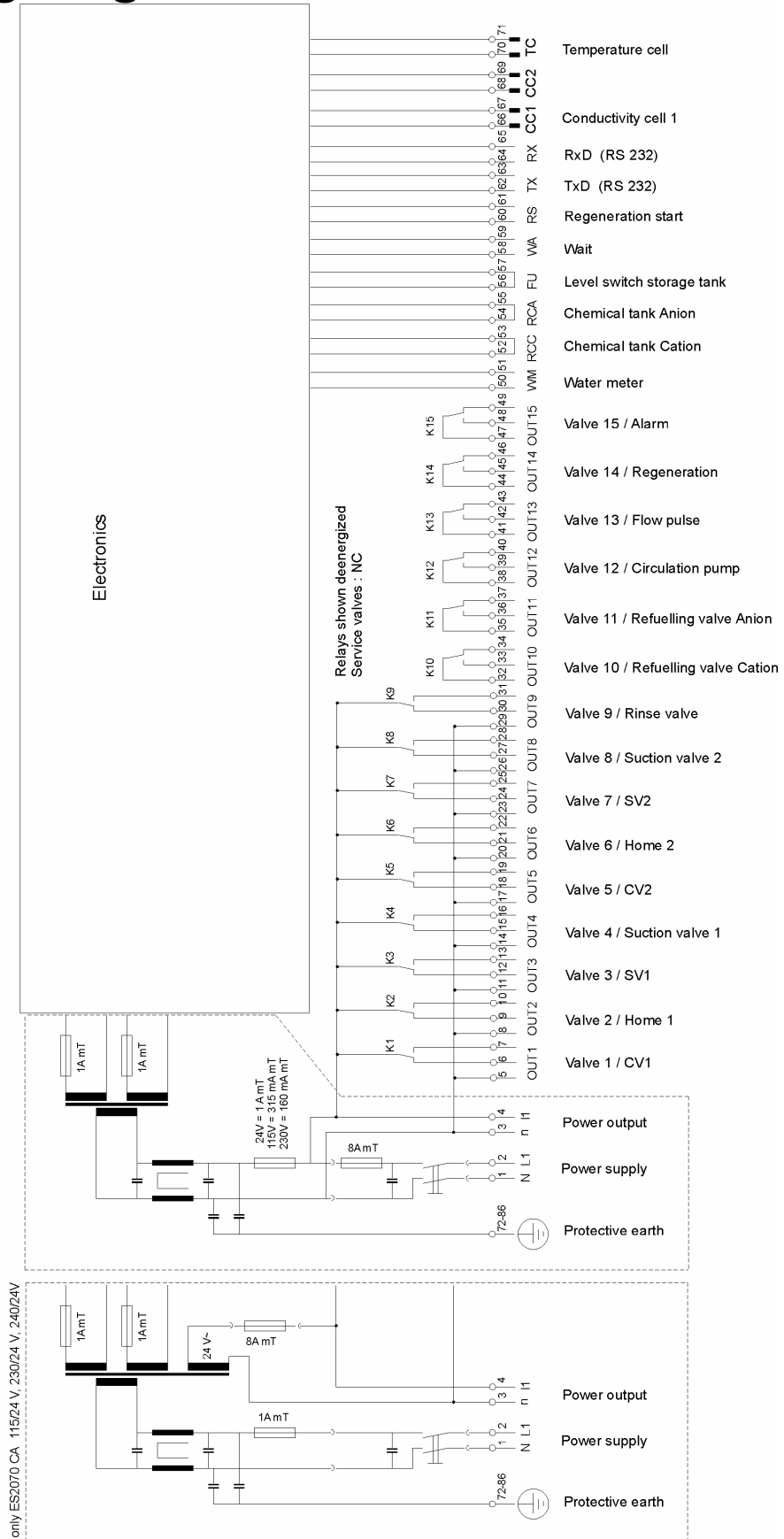
17 Fill in list programming

Programming																				
Company :					Control : ES2070 CA															
Contact person :					Software version :															
Project :					Serial number :															
Step	Description	Setting			Step	Description	Setting													
1.1	LED Display	Yes	No		5.4	Outputs														
1.2	TDS	Yes	No			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.3	TDS Factor					SV														
1.4	Cell constant	cm-1				SP														
1.5	Correction factor					HO														
1.6	Min. monitoring	Yes	No			1														
1.7	Min. limit value	µS/cm				2														
1.8	Delay time	s				3														
1.9	Max. monitoring	Yes	No			4														
1.10	Max. limit value	µS/cm				5														
1.11	Delay time	s				6														
2.1	Temperature manual	Yes	No		7															
2.2	Temperature	°C			8															
2.3	Display LCD	Yes	No		5.5	Pulse duration														
2.4	Max. monitoring	Yes	No			1	:	s	4	:	s	7	:	s						
2.5	Max. limit value	°C				2	:	s	5	:	s	8	:	s						
2.6	Delay time	s			3	:	s	6	:	s										
3.1	Control	Alt	Imp	SV	6.2	Stages														
3.2	OUT9	FV	VA	-	6.3	Regeneration times														
3.3	OUT10	FCC	VA	-		1	:	m	4	:	m	7	:	m						
3.4	OUT11	FCA	VA	-		2	:	m	5	:	m	8	:	m						
3.5	OUT12	CP	VA	-	3	:	m	6	:	m										
3.6	OUT13	FP	VA	-	6.4	Outputs														
3.7	OUT14	RE	VA	-		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3.8	OUT15	AL	VA	-		SV														
3.20	Filling time cation	m				SP														
3.25	Filling time anion	m				HO														
3.30	Rinsing time	s				1														
3.40	Circ.pump during service	Yes	No			2														
3.41	Circ.pump during stand by	Yes	No			3														
3.42	CP Interval	Yes	No		4															
3.43	Interval time switched off	m			5															
3.44	Circulation time switched on	m			6															
3.50	Pulse duration	s			7															
4.1	IN1	WM	-		6.5	Pulse duration														
4.2	IN2	RCC	-			1	:	s	4	:	s	7	:	s						
4.3	IN3	RCA	-			2	:	s	5	:	s	8	:	s						
4.4	IN4	FU	-		3	:	s	6	:	s										
4.5	IN5	WA	-		7.1	Regen.start conductivity				Yes	No									
4.6	IN6	RS	-		7.10	Regen. start water meter				Yes	No									
4.10	Litres / pulse	l/p			7.20	Interval start				Yes	No									
4.20	Regen.start delay 1 (after regen.)	s			7.21	Interval time				h										
4.21	Regen.start delay 2 (before reg.)	s			7.30	Clock start				Yes	No									
5.1	Capacity	m ³			7.31	Day selection 1				Su	Mo	Tu	W	Th	Fr	Sa				
5.3	Stages	Regeneration times																		
		1	:	m	4	:	m	7	:	m										
		2	:	m	5	:	m	8	:	m										
7.32	Time 1																			
7.33	Day selection 2	Su	Mo	Tu	W	Th	Fr	Sa												
7.34	Time 2																			
8.1	Prohibited regeneration	Yes				No														
8.2	Day selection 1	Su	Mo	Tu	W	Th	Fr	Sa												
8.3	Time1																			
8.4	Time2																			
8.5	BV opened	Yes				No														
9.1	Maintenance	Yes				No														
9.2	Maintenance interval																			
10.1	Alarm (1)	PF	MI	MA	TM															
10.2	Alarm (2)	DY	WA	RCC	RCA															
10.3	Alarm (3)	FC	FA	MT																

18 Wiring diagram ES2070 CA

Connection terminals ES2070 CA

ES2070 CA - 24 V : no control lamp in the main switch



See next page for a glossary.



18.2 Glossary

Outputs

Valve	Valve
FV	Rinsing valve
FCC	Refuelling valve for filling the chemical tank of the cation filter
FCA	Refuelling valve for filling the chemical tank of the anion filter
CP	Circulation pump
FP	Flow pulse, the incoming water meter pulses are passed on here
RE	Regeneration, indicates that the filter is in regeneration
AL	Alarm

If programmed for pulse control: (see 14.3 "Output functions" on page 29)

CV1	Central control valve cation
HOME1	"float" for control valve cation
SV1	Service valve cation
Zuigafsluiter1	Suction valve cation
CV2	Central control valve anion
HOME2	"float" for control valve anion
SV2	Service valve anion
Zuigafsluiter2	Suction valve anion

Inputs

WM	Water meter
RCC	High level switch in the chemical tank of the cation filter
RCA	High level switch in the chemical tank of the anion filter
FU	High level switch in the storage tank of the demineralised water
WA	Wait
RS	External start regeneration

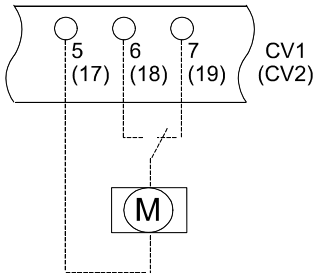
Measuring

CC1	Conductivity meter 1
CC2	Not applicable
TC	Temperature sensor for automatic temperature correction CC1

Communication

TX	Not applicable
RX	Not applicable

19 Electrical connection examples

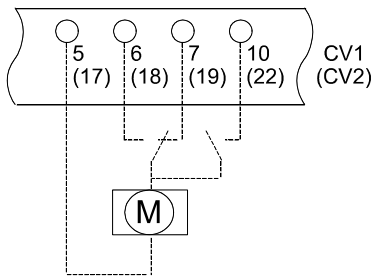


Switch connection.

Central control valve or pilot distributor without automatic service position.

Two or four steps.

Phase changes between the terminals 6 (18) and 7 (19).

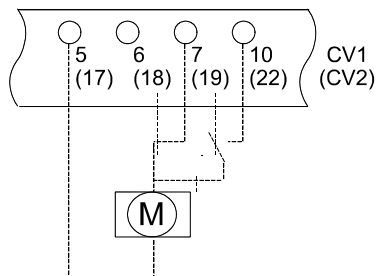


Central control valve or pilot distributors with automatic service position.

Two or four steps.

Phase changes between the terminals 6 (18) and 7 (19).
In service position: phase on terminal 10 (22).

Pulse connection.



Central control valve or pilot distributors with automatic service position.

Two or four steps.

Phase changes between the terminals 6 (18) and 7 (19).
In service position: phase on terminal 10 (22).



20 Installation and commissioning requirements

20.1 General

- Install control at eye level and easy accessible to the user.
- Do not mount underneath damp piping.
- Realise electric connections. Comply with the regulations of the local electricity company as well as the with any fabric standards.
- Provide an impeccable earth connection.
- Keep all low voltage wiring (inputs and measurements) apart from feeder cables.
- Switch device on and carry out the basic programming by means of this instruction manual and technical information of the supplier.
- Set actual time.
- Install and implement according to the regulations of the manufacturer.

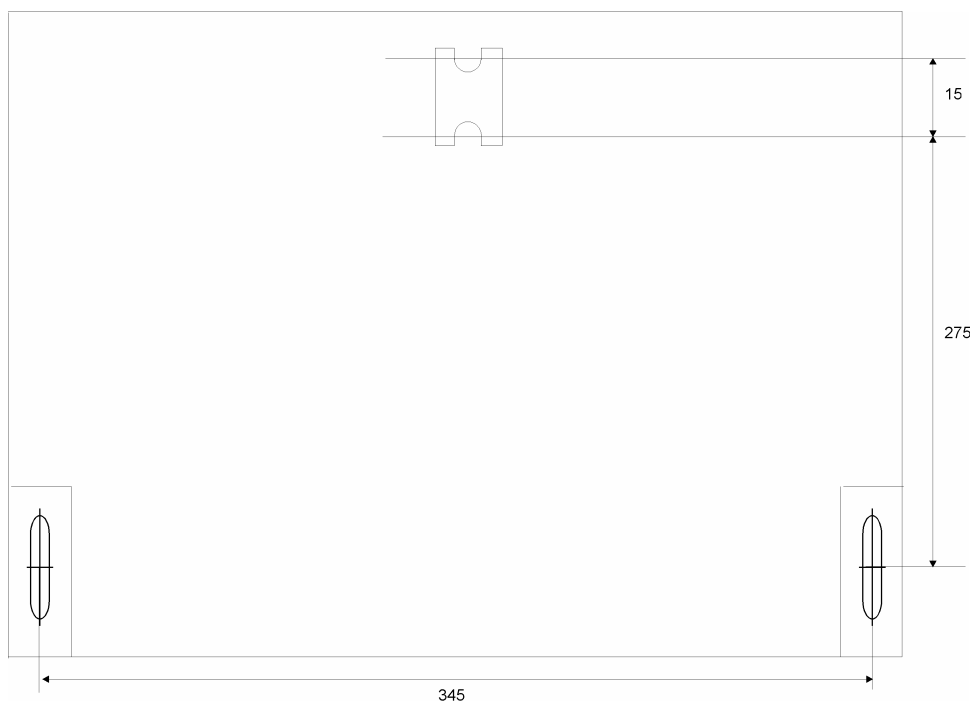
ATTENTION:

Some external relays, contactors, magnet valves, etc. can cause unwanted noise during switching on and / or off.

For this reason we advise you to equip the components mentioned in advance of a so called RC-network.

Inquire at the supplier of the components mentioned about the right type of RC-network.

20.2 Assembly





21 Technical details



Electrical 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 the purpose of outputs 8AT

Power input:	11 VA	input voltage is equal to output voltage
	107 VA	input voltage is not equal to output voltage

Voltage-bearing outputs:	resistive total max. 4A at 115/24V, 230/24V and 240/24V.
	resistive total max. 8A at 24V/24V, 115V/115V, 230V/230V

Potential free outputs:	max. charge 250V, 8A (resistive)
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Inputs (digital):	charged with 12V, 8 mA
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Class of protection:	IP65
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Ambient temperature:	0 – 50 °C
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Weight:	ca. 4,0 kg
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Dimensions:	W x H x D = 390 x 318 x 160
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Remarks:	Data is saved at loss of voltage.
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22 Declaration of conformity

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

Product description

Product name : Controller for demineralisation plant
Product type : ES2070CA
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 55011
Immunity standard : EN 50082-1

Report

Report number : EWS/EMC/0111

This declaration was issued by:

Date : 26-02-2007

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 CONSEQUENCES

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.