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Operating Instructions

Reverse-Osmosis-Systems

**UO 100/250/300/400 combi D**



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## Imprint

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## 1. Notes on using the Operating Instructions

**Purpose:** The Operating Instructions are intended for users of the system and contain information on how to operate and maintain the system safely and reliably.

**Availability:** The Operating Instructions must always be available at the place where the system is in use.

**Subdivision:** The Operating Instructions consist of a number of chapters named by letters of the alphabet. An outline of all the chapters appears on Page 1.  
The header and page numbering, along with the letter identifying each chapter, make it easier for you to orient yourself.  
For information on the content of a specific chapter, please refer to the contents on the first page of that chapter.

<b>Conventions/ abbreviations:</b>	OI	Operating Instructions
	TD	Technical Documentation
	RO	Reverse Osmosis
	Permeate	Product water resulting from RO
	Product	Product water from the UP system
	Cy	Conductivity
	-	Enumerated items
		Steps to be performed

## 2. General safety information

### 2.1 Explanation of symbols and references



Danger

This symbol refers to an immediate danger that threatens the safety and life of persons. Failure to observe these notices will have severe consequences on health and safety, including life-threatening injuries.



Warning

This symbol refers to a possible danger that threatens the safety and life of persons. Failure to observe these notices may have severe consequences on health and safety, including life-threatening injuries.



Caution

This symbol refers to a possibly hazardous situation. Failure to observe these references may result in minor injuries and/or damage to property.



This symbol points out important information for working with the system in a proper manner. Failure to observe these references may result in malfunctions in the system or disturbances in the environment.

### 2.2 Additional safety requirements

Country-specific requirements, standards and regulations must be observed.

### 2.3 Usage in accordance with intended purpose

The RO-system is used to desalinate softened water. The system must only be operated with water supplied in accordance with the quality described in Chapter C/2 and the operating parameters specified there.

The system must not be operated unless it is in proper working order. Any malfunctions must be rectified immediately.

### 2.4 Operating staff

Only persons who have read and understood these Operating Instructions are permitted to operate the system. When operating the system, it is particularly important to observe the safety information strictly.

## 2.5 Residual dangers



Danger

- Water damage
  - To avoid accumulation of spills caused by leaks, the area in which the system is set up must be equipped with a floor drain and/or a leak monitoring system and corresponding alarm.
- Electrical shock
  - Do not touch electrical components with wet hands.
  - Before performing tasks on parts of electrical system, disconnect the system from the power supply.
- Mechanical force
  - Parts of the system are under excess pressure of up to 25. Release the pressure from the system before repairs and maintenance tasks.

## 2.6 Bringing the system to a stop in the event of an emergency

- ☞ Turn off the main switch
- ☞ Shut off the water supply

After remedying the damage:

- ☞ Open the water supply
- ☞ Turn on the main switch

## 2.7 Safety information for maintenance tasks

The operator must take pains to ensure that all maintenance, inspection and assembly tasks are performed by authorized and qualified professionals who have been sufficiently informed for the task at hand by thoroughly studying the Operating Instructions. These tasks must be properly performed by professionally trained staff members.

The system must be shut down and protected from being placed in operation again unintentionally before all repair and maintenance tasks. It is absolutely essential to observe the procedure described in these Operating Instructions for shutting down the system.

Before beginning tasks on the electrical equipment of the system, a check must confirm that power has been disconnected from the corresponding section of the system. In addition, the system must be secured to prevent it from being turned on again unintentionally.

Protective clothing suitable for the hazard at hand must be worn while performing the task.

### **2.7 Disposing of system parts and operating materials**

When they need to be discarded, system parts must be disposed of according to local requirements including separately if so required.

### **2.8 Unauthorized conversion and manufacturing replacement parts**

Conversion or modification of the system is only permitted with the approval of the manufacturer. The same applies to making changes in the programming for the control system. Original replacement parts and accessories authorized by the manufacturer enhance safety. Use of other parts will void the warrantee.

### **2.9 Warrantee claims and liability**

This product corresponds to the state of the art and was designed and manufactured in accordance with applicable rules of the technology, after which it was subjected to a quality control process. If there should nevertheless be any grounds for complaint, please direct requests for replacement to the manufacturer of this product in accordance with the general terms and conditions of sale and delivery.

### 3. Basic principles of reverse osmosis systems

#### 3.1 The principle of reverse osmosis

Osmosis is a process on which nearly all natural metabolic processes are based. If two solutions of varying concentrations are separated in a system by a semipermeable membrane, the solution with the higher concentration will always have a tendency to become more diluted. This process (osmosis) will continue until osmotic equilibrium is achieved.

In the process of reverse osmosis, the direction of the osmotic flow is reversed. To achieve this, pressure must be exerted on the concentrated solution. This pressure must be considerably greater than the osmotic pressure that arises due to the natural balancing of differing concentrations.

Synthetic membranes are used in water treatment systems that work on the principle of reverse osmosis. These membranes are permeable for water molecules. The content materials dissolved in the water are held back by the membranes. High pressure causes the concentrated solution (for example drinking water or process water) to flow through these membranes. The result is a separation of this solution into a partial flow with water in which the content materials that are held back are located (concentrate).

#### 3.2 Calculation equations

$$\text{Yield [\%]} = \frac{\text{permeate output [l/h]} \cdot 100\%}{\text{feed water input [l/h]}}$$

$$\text{feed water input} = \text{Permeate output} + \text{concentrate output}$$

$$\text{Concentrate output [l/h]} = \frac{\text{permeate output [l/h]} \cdot 100\%}{\text{yield [\%]}} - \text{permeate output [l/h]}$$

$$\text{Desalination rate [\%]} = \left[ 1 - \frac{C_{y \text{ permeate}}}{C_{y \text{ raw water}}} \right] \cdot 100\%$$



### 3.3 Temperature dependency of permeate output



The permeate output of the system depends on the temperature of the feed water. The nominal output specified in the technical data and on the rating plate refers to the design temperature specified in Chapter C/2.

The actual output at a specific feed water temperature can be calculated from the following table using a correction factor.

The specific temperature-related permeate output can be calculated according to the following calculation equation:

$$\text{Permeate output at X } ^\circ\text{C} = \text{Rate output} \cdot \text{Correction factor F}$$

T in °C		Correction factor
Design temperature	Nominal output = 100%	1.00
-1		0.96
-2		0.92
-3		0.88
-4		0.84
-5		0.80
-6		0.77
-7		0.74
-8		0.70
-10		0.67
-11		0.64



**If the system is operated at a higher feed water temperature than the design temperature, care must be taken not to exceed the maximum permeate output that is specified on the rating plate and in the technical data (C/2)!**



After switching on the RO system permeate with high conductivity is produced for a short time. Therefore it is to be made certain during the interpretation of the peripheral equipment technology that a minimum running time of the RO system of at least 30 min per shifting process is ensured.

### 1. Transport and storage

- Systems of type RS and RSE, ND,KR, AS, ES, combi, ED,NF, UP and EP should be transported upright.
- Systems of type W should be transported lying down.
- Systems of type W/S may be transported either standing or lying down.



- **During transport, all systems must be secured against slipping and falling over!**
- The transport weight corresponds to the empty weight. For transport weights, please refer to the Technical Data in Chapter C/2.
- The system can be damaged by frost. Because of this, the system must be protected against frost and freezing during transport and storage.
- The maximum storage temperature is 40°C.
- The maximum storage duration for the system in original packing is 3 months at 20 °C. After that, the preservative fluid must be rinsed out and replaced if necessary.

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## 1. Technical data

System		UO 100 combi D	UO 250 combi D	UO 300 combi D	UO 400 combi D
Code No.		420 109	420 084	420 118	420 090
Control		RO 500			
Matching softener		HS SK 621			
<b>Feed water specification</b>					
Feed water pressure min./max.	bar	2/6			
Pressure fluctuations (limit)	bar	± 0.5			
Temperature min./max.	°C	5/35			
<b>Connections</b>					
Feed water	DN	20			
Permeate	DN	10			
Concentrate	HT	50			
Power consumption	kW	0.55			
Power connection	V/Hz	230/50			
Protection type		IP 54			
<b>Output data</b>					
Permeate outlet max.	l/h	100	250	300	400
Concentrate min.	l/h	33	83	100	133
Concentrate backflow	bar	14			
Permeate counterpressure max.	bar	0.3; prevent permeate backflow!			
Recovery	%	75			
Salt rejection rate	%	97			
<b>Dimensions and weight</b>					
Dimensions (HxWxD)	mm	1650x760x700			
Weight approx.	kg	135	140	155	155
<b>Environmental data</b>					
Max. ambient temperature	°C	40			
Relative humidity (air)	%	<95, non-condensing			

Systems are designed for drinking water without chlorine in accordance with the German Drinking Water Regulation with a salt content of 1000 mg/l and at a feed water temperature of 15 °C.

## 2. Usage limits



The limit values specified in Chapter C/2 "Technical Data" apply for usage of the system.

## 3. Product description

### 3.1 Rating plate

The rating plate is located on the front side of the system. It contains important information on the output and maximum operating parameters of the system.

To ensure fast and problem-free processing of warranty claims, technical information or customer service, be sure to indicate the system type, item number and manufacturing number!

### 3.2 Working principle diagram

See the R+I diagram in the appendix

### 3.3 Functional description

Das durch den Vorfilter vorgefilterte Wasser gelangt über den Rohrtrenner zur Enthärtungsanlage. Die Enthärtungsanlage reduziert die Gesamthärte des Speisewassers auf einen Wert  $< 0,1$  °dH. Über einen Härtekontrollsensor und einen Feinfilter wird das Weichwasser zur UO-Anlage geführt. Eine Pumpe fördert das Wasser mit hohem Druck (abhängig von der Anlagengröße) über die semipermeablen Membranen. Weitgehend von Salzen befreites Wasser (Permeat) gelangt durch die Membranen. Die zurückgehaltenen Salze werden mit dem Konzentrat kontinuierlich abgeführt.

Die Steuerung der Anlage überwacht und steuert während der Permeatproduktion und während der Stillstandszeiten alle wichtigen Funktionen.

### 3.4 Short description of the components

<b>Pressure gauge prefilter (OPr01)</b>	Display of the inlet pressure.
<b>Filter (OF01)</b>	Protects the softener from impurities (filter fineness 100µm).
<b>Pressure gauge prefilter (OPr02)</b>	Display of the outlet pressure
<b>Line separator (OX01)</b>	Separates the water treatment unit from the drinking water system
<b>Softener (OX02)</b>	Used to soften the drinking water
<b>Hardness monitoring device (1X02)</b>	Continuously monitors soft water quality and generates an alarm message if a limit value is exceeded.
<b>Pressure gauge fine filter inlet (1Pr01)</b>	Display of the inlet pressure.
<b>Fine filter (1F01)</b>	Protects the RO membranes from impurities (filter fineness 5µm).
<b>Pressure gauge fine filter outlet (1Pr02)</b>	Display of filter outlet pressure
<b>Sample removal tap for softened water (1V07)</b>	Used to remove samples from the softened water of the system.
<b>Inlet solenoid valve (1V01)</b>	Is always open during permeate production.
<b>Pressure switch (1Pr03)</b>	Monitors the inlet pressure.
<b>Pump (1P01)</b>	Produces the pressure required for the reverse osmosis process.
<b>Pressure gauge operating pressure (1Pr05)</b>	Display of the operating pressure.

<b>Pressure gauge (concentrate pressure) (1Pr06)</b>	Display of the concentrate pressure.
<b>Pressure regulating valve (1V05)</b>	Controls the amount of concentrate directed in front of the pump
<b>Concentrate regulating valve (1V06)</b>	Used to set the amount of concentrate to be led away
<b>Flow meter for concentrate (1FI01)</b>	Display of the RO concentrate quantity
<b>Permeate measurement cell (1Q02)</b>	Measures the conductivity of the permeate. The control system is used to turn off the system if a limit value is exceeded.
<b>Permeate flow meter (1FI02)</b>	Displays the permeate flow level
<b>Control system</b>	Monitors and controls all important functions during the operation of the system.

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### 1. Set-up

#### 1.1 Requirements for the set-up location

- The space required for the system may be derived from the measurements specified in Chapter C/21. In addition, there should be 1 m of space on each side available for operating and maintaining the system.
- The room in which the system is set up must meet the environmental conditions specified in Chapter C/2.
- The minimum bearing capacity at the set-up location must be 150% of the operating weight specified in Chapter C/2.
- The set-up surface must be even and run horizontally.
- The room must be well ventilated and not exposed to freezing temperatures.
- To avoid accumulation of spills caused by leaks, the area in which the system is set up must be equipped with a floor drain and/or a leak monitoring system and corresponding alarm.
- The necessary electrical connections must be available on the construction side (see Chapter C-1) and must be located no more than 2 m away from the system.

#### 1.2 Setting up the system

- ☞ Unpack the system.
- ☞ Check over the delivery for completeness and transport damage. (See Chapter C-3.2 for scope of delivery). Any deviations or damage must be reported to the manufacturer immediately.
- ☞ Move the system carefully to the place provided for it with a suitable lifting device.
- ☞ The system must be set up on a holding surface in accordance with the requirements of Chapter C/2.

## 2. Water-side connections

### 2.1 Necessary qualifications of the assembly staff



The water-side connection must only be made by trained professional staff members. Observe general regulations (in German-speaking countries, DIN, DVGW, SVGW and ÖKGW) as well as local installation requirements while installing the system.

### 2.2 Making the hydraulic connections

#### Inlet

- ☞ Remove the sealing disks from the screw connection in the inlet.
- ☞ Connect the inlet.

#### Permeate

- ☞ Remove the sealing disks from the screw connection in the permeate output.
- ☞ Connect the permeate output with the consumer line.

#### Concentrate

- ☞ Remove the sealing disk from the concentrate line.
- ☞ Connect the concentrate output with the drain

#### Waste water

- ☞ Connect the waste water (HT50) with the drain



Caution

In standstill times of the system the max. back pressure of 0,3 bar must not be exceeded.

The cross section of permeate piping by customer may only be one nominal width greater than the permeate output piping of the system.

At a back pressure > 0,3 bar and the danger of permeate backflow, a check valve has to be installed into permeate piping.

It is only allowed to install a shut-off valve into permeate piping if also a relief valve is installed.

### 3. Electrical connection

#### 3.1 Necessary qualifications of the assembly staff



Danger

Electrical connection tasks may only be performed in Germany by an electrician certified by VDE in accordance with the applicable requirements.

#### 3.2 Connecting the power supply



Danger

Before connecting the power supply, make certain that the corresponding main switch is turned off!

- ☞ Make the power supply connection in the control cabinet with a fixed connection according to the circuit diagram.

#### 3.3 Connecting the accessories / signal exchange

Connections for the

- Product container level
- Forced stop
- Combined malfunction

should be made according to the circuit diagram.

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## 1. Placing the system in service

### 1.1 Qualifications of the commissioning staff



The system must be placed in service by qualified professionals.



Before the system is placed in service, all screw connections must be retightened.

### 1.2 Placing the softener in service



For the start up of the softener see the operating instruction in the appendix of this manual!

### 1.3 Rinsing out the preservative fluid



The preservative solution contains 1.5% sodium bisulfite and 20% glycerin.  
The preservation fluid should be drained out into the run-off channel in accordance with applicable regulations governing pouring and draining.

- ☞ Connect the product permeate with run-off channel
- ☞ Open valves 1V05 and 1V06 completely
- ☞ Open feed water
- ☞ Turn on main switch
- ☞ Set the system into operation (see Chapter F)  
**and rinse for minimum 30 minutes**



The higher permeate conductivity during the rinsing of the system can cause a shut down of the system.  
In this case quit the malfunction (see Chapter F) and continue rinsing.

#### 1.4 Adjusting the operating parameters

- ☞ Adjust min. concentrate flow (see chapter C/2) at 1FI01 with valve 1V06
- ☞ Adjust permeate flow (see Chapter C/2) at 1FI02 with valve 1V05
- ☞ If necessary adjust concentrate recirculation (see Chapter C/2) with valve 1V06
  
- ☞ **Record the operating data of the system on a control sheet (see Chapter H)**
  
- ☞ Turn off the system
- ☞ Reconnect the permeate with the tank or consumer



**In no event should the values specified in the technical data for permeate output, recovery, operating pressure and product output be exceeded.**



The permeate output of the system depends on the temperature of the feed water. For further information see Chapter A/3.2.

## 2. Taking the system out of service



**Taking the system out of service refers to a down time of >30 days for the system. When the system is taken out of service, it must be preserved.**

**For information on preserving the system, please see chapter I.**

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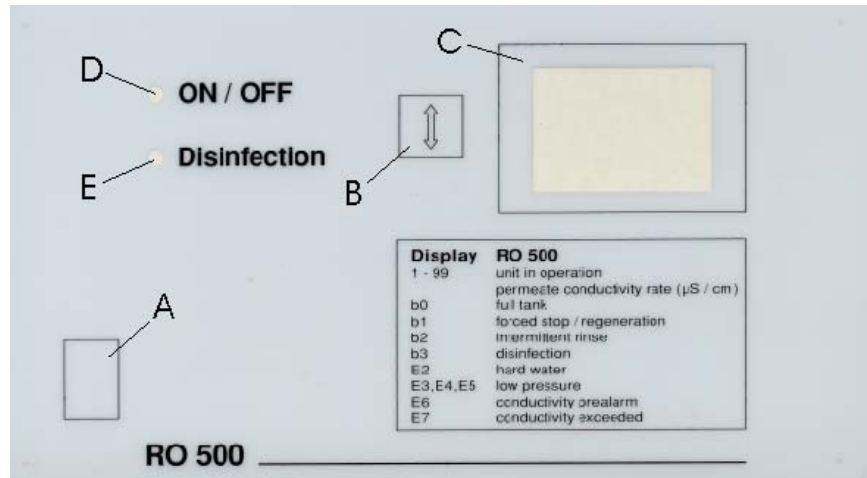
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1. Operating and display components



	Benennung	Funktion
A	Main switch	- Turns the system on and off - Störungsquittierung
B	Key button	- Call up disinfection - Call up calibration
C	Display	Display of: - current conductivity of permeate - current operating state - malfunction
D	LED operation (green)	Permanent: → system in operation, no malfunction Flashing: → malfunction active
E	LED disinfection (red)	Permanent: → disinfection activ



For additional information on the function and operation of the RO 500 control unit, please refer to the RO 500 control unit manual in the appendix of these Operating Instructions.



## 2. Operating states

<b>Operation</b>	<p>Display: <b>cy</b>                      Input <b>NVO</b> (terminal 21,22) closed                      Inlet valve 1V01 opened, pump 1P01 in operation                      System is producing permeate</p>
<b>Tank full</b>	<p>Display: <b>b0</b>                      Input <b>NVO</b> (terminal 21,22) opened                      System is turned off</p>
<b>Discont. rinsing</b>	<p>Display: <b>b2</b>                      Time-controlled permeate production, if operating state <b>Tank full</b> has been active for the set time.</p>
<b>Forced stop</b>	<p>Display: <b>b1</b>                      Input <b>REG</b> (binding post 23,24) opened                      System is turned off till Input <b>REG</b> closed again</p>
<b>Desinfection</b>	<p>Display: <b>b3</b>                      System in operation <b>without any safety devices</b></p>

## 3. Short description of the RO 500 control system

- 3.1 Turn on system**
- ☞ Main switch 0/I (A) in position **I**
    - Display: **88**: Initialisation
    - Display: **b0**: Tank full
    - Display: **15**: Operation with display of conductivity of permeate (e. g. 15 µS/cm)
- 3.2 Turn off system**
- ☞ Main switch 0/I (A) in position **0**



**For additional information on the calibration and settings of the RO 500 control unit, please refer to the RO 500 control unit manual in the appendix of these Operating Instructions.**

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## 1. General information

The use of high-quality individual components and installing safety and monitoring equipment in our systems allows us to reach a very high level of operational availability.

If an operating malfunction should nevertheless arise, the error can easily be detected using the following malfunction table and the cause eliminated.

If serious malfunctions occur, please contact the manufacturer (see rating plate).



**Only qualified professional personnel with the appropriate training should eliminate malfunctions, taking into consideration the safety requirement in Chapter A of these Operating Instructions!**

**Power must be disconnected from the system before beginning these tasks, and the system must be protected to ensure it is not turned on again unintentionally!**

**Pressure must be released from all lines.**

### 1.1. Malfunction message to the manufacturer

To ensure effective help in resolving malfunctions, please have the following information on hand:

- Manufacturing number
- Item number
- System type
- Log sheets and maintenance sheets from the last 4 months

### 1.2. Malfunction display

- green operation-LED is flashing
- E<fault number> appears in the display

### 1.3. Malfunction reset

- ☞ Switch off system for a short time
- ☞ After turning on the system again, the malfunction is eliminated

2. Malfunction table

Malfunction	Cause	Remedy
Control display dark	Power supply interrupted	Make power supply connection
	10 A fuse F1 defective	Unscrew the front plate and replace the fuse in question
	200 mA fuse F2, F3 defective	
	Flat band cable between the motherboard and the display unplugged	Unscrew the front plate and plug the cable back in
	Control system defective	Replace the control system
Display <b>E2</b> : Hard water	Hard water sensor triggered (if present)	- Check the soft water quality - Check the sensor and replace if necessary
	Wire jumper defective	Restore the wire jumper
Display <b>E3, E4, E5</b> : Low pressure	Feed water pressure too low	- Check the pressure difference on the softener - Increase the feed water pressure
	Filter blocked	Replace the filter cartridge
	Pressure switch defective	Replace the pressure switch
	1V01 input valve defective	Replace the valve
Display <b>E7</b> : Cy of permeate too high	Conductivity of feed water too high	Calculate desalinization rate Target: > 97%
	Desalinization rate too low	After consultation with the manufacturer: - Clean RO modules - Replace RO modules
System doesn't start	Display <b>b0</b> tank full, although permeate tank empty	Level switch defective
	Display <b>1-99</b> system in operation	Pump defective
	Display <b>b1</b> forced stop	Connected softener is in regeneration
Permeate output too low	Feed water temperature too low	Calculate permeate output according to Chapter A3.3
	Permeate counterpressure too high	Check permeate line
	Modules blocked	After consultation with the manufacturer: - Clean RO modules - Replace RO modules
	Pump defective	Replace pump

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## 1. Maintenance and monitoring tasks

### 1.1 Safety information



The operator must ensure that all maintenance, monitoring and assembly tasks are performed by authorized and qualified trained personnel.

The system must be shut down and protected from being placed in operation again unintentionally before all repair and maintenance tasks.



Before beginning tasks on the electrical systems and equipment, a check must confirm that power has been disconnected from the system. In addition, the system must be secured to prevent it from being turned on again unintentionally.

Protective clothing suitable for the hazard at hand must be worn while performing the maintenance tasks.

Immediately after the maintenance tasks are completed, all safety and protective equipment must be set back in place and functionality restored.

### 1.2 General information

To ensure long-term problem free operation of the system, maintenance tasks must be performed at regular intervals and a record must be kept of operating parameters!

The record of operating parameters and maintenance tasks should be kept by the operator of the system himself.



Signing a maintenance contract with the supplier makes it possible for the supplier to take over the responsibility of performing regular maintenance tasks on the system.

A record book should be kept to record operating parameters. It is located in the appendix of these operating instructions. The purpose of this record keeping is to have continuous documentation of the operating parameters. This makes it easier to detect a drop in output or incorrect functionality of the system and then to eliminate the problem.

The documentation of maintenance tasks should be kept on the maintenance log that is provided for this purpose.

## 2. Logging operating parameters

The following parameters must be checked and recorded **weekly**:

Parameter	Measurement point/remarks
Hardness feed water	Check with the hardness kit on the 0V01 tap
Conductivity of soft water	Measurement with Cy measuring instrument
pH value/ Temperature of feed water	Measurement with pH value
Residual hardness in soft water	Measurement with the hardness kit on the 1V07 tap
Stock of salt in the brine tank	Check stock of salt and refill. Refill-interval depends on flow quantity!
Filter/fine filter inlet pressure	0Pr01 pressure gauge
Filter/fine filter outlet pressure	0Pr02 pressure gauge
Operating pressure	1Pr05 pressure gauge
Concentrate pressure	1Pr06 pressure gauge
Permeate output	1FI02 flow meter
Concentrate output	1FI01 flow meter
Conductivity of permeate	Control display
Conductivity of permeate	Control display
Desalination rate RO	For calculation see Chapter A 3.2
Absence of leaks in the system	Check system for damages or leaks

Minor fluctuations in the conductivity of the permeate and permeate output are normal. The effect of the temperature or a fluctuating conductivity may be reasons for this. When the desalination rate drops below 97% or there is a drop in permeate output of about 10%, a concentrate rinse should be performed (H/2.1).



### 3. Maintenance



Maintenance tasks should be performed when needed, but no less often than at the maintenance specified intervals!

#### 3.1 Maintenance tasks

The following maintenance tasks should be performed:

System part	Task to be performed	Maintenance interval
Filter (0F01/1F01)	Replace the fine filter cartridges and clean the filter housing	- 3 months - if the pressure drops by 0.8 bar
Pressure switch	Functional test by blocking off the feed water inlet  → RO must switch off	- 6 months
Line separator	Functional test by blocking off the feed water inlet  → The spring of the line separator must relax	- 6 months
Sensor of hardness monitoring device	replace sensor	- 12 months - when sensor triggered off
- Conductivity cell(s) - pH-sensor (if existing)	Check of parameters with reference device, if necessary new calibration	- on start-up - 1 year - if quality of feed water changes
Softener	See operating instruction in the appendix	
Accessories	see operating instructions in the appendix	



### 3 2 Performing a concentrate rinse (water brushing)

During a concentrate rinse, the increase in the flow of concentrate flows more strongly through the membrane(s). Because of this, soluble accretions are more readily removed and rinsed away.

The duration of a "water brushing" should be at least 60 minutes, and it should be performed as follows:

- ☞ Log record of actual values
- ☞ Open the 1V06 concentrate valve
- ☞ Open the 1V05 pressure control valve
- ☞ Allow to rinse for at least 60 minutes
- ☞ Adjust the operating parameters to the target values
- ☞ Log record of actual values

**Note:**

**If the conductivity of the permeate does not improve permanently after a concentrate rinsing, a chemical cleaning of the membranes must be performed.**

**In this case, it is essential to contact the supplier to agree upon the further procedure!**

**Log sheet**

Customer: \_\_\_\_\_

System Type: \_\_\_\_\_

\_\_\_\_\_

Item No.: \_\_\_\_\_

\_\_\_\_\_

Placed in service on: \_\_\_\_\_

Date		Values when placed in service				
Hardness feed water	°dH					
Conductivity of soft water	µS/cm					
pH value						
Temperature of feed water	°C					
Residual hardness in soft water	°dH					
Stock of salt in the brine tank	-					
Filter/fine filter inlet pressure 0Pr01/1Pr01	bar					
Filter/fine filter outlet pressure 0Pr02/1Pr02	bar					
Operating pressure 1Pr05	bar					
Concentrate pressure 1Pr06	bar					
Permeate output 1FI02	l/h					
Concentrate output 1FI01	l/h					
Conductivity of permeate	µS/cm					
Desalination rate RO	%					
Absence of leaks in the system						

**Note:** The values when placed in service must be entered when the system is placed in service.  
 After that, this log sheet should be duplicated. As described in chapter H, the operating parameters should be documented weekly.  
 If there is a significant deviation in actual values from the values when placed in service, the operator should contact the supplier and if appropriate send this log to the supplier as well.

**Maintenance log**

Customer: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

System type: \_\_\_\_\_  
 Item No.: \_\_\_\_\_  
 Placed in service on: \_\_\_\_\_ CW \_\_\_\_\_

1. Quarter / year: \_\_\_\_\_

System part	CW 1	CW 2	CW 3	CW 4	CW 5	CW 6	CW 7	CW 8	CW 9	CW 10	CW 11	CW 12	CW 13
Filter (0F01/1F01)													
Pressure switch													
Line separator													
Sensor of hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Accessories													

**Note: Each maintenance task should be documented with a date and the initials of the person performing the task.  
 Copies should be made of the maintenance log before the first entries are made!**

**Maintenance log**

Customer: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

System type: \_\_\_\_\_  
 Item No.: \_\_\_\_\_  
 Placed in service on: \_\_\_\_\_ CW \_\_\_\_\_

2. Quarter / year: \_\_\_\_\_

System part	CW 14	CW 15	CW 16	CW 17	CW 18	CW 19	CW 20	CW 21	CW 22	CW 23	CW 24	CW 25	CW 26
Filter (0F01/1F01)													
Pressure switch													
Line separator													
Sensor of hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Accessories													

**Note: Each maintenance task should be documented with a date and the initials of the person performing the task.  
 Copies should be made of the maintenance log before the first entries are made!**

**Maintenance log**

Customer: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

System type: \_\_\_\_\_  
 Item No.: \_\_\_\_\_  
 Placed in service on: \_\_\_\_\_ CW \_\_\_\_\_

3. Quarter / year: \_\_\_\_\_

System part	CW 27	CW 28	CW 29	CW 30	CW 31	CW 32	CW 33	CW 34	CW 35	CW 36	CW 37	CW 38	CW 39
Filter (0F01/1F01)													
Pressure switch													
Line separator													
Sensor of hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Accessories													

**Note: Each maintenance task should be documented with a date and the initials of the person performing the task.  
 Copies should be made of the maintenance log before the first entries are made!**

**Maintenance log**

Customer: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

System type: \_\_\_\_\_  
 Item No.: \_\_\_\_\_  
 Placed in service on: \_\_\_\_\_ CW \_\_\_\_\_

4. Quarter / year: \_\_\_\_\_

System part	CW 40	CW 41	CW 42	CW 43	CW 44	CW 45	CW 46	CW 47	CW 48	CW 49	CW 50	CW 51	CW 52	(KW 53)
Filter (0F01/1F01)														
Pressure switch														
Line separator														
Sensor of hardness monitoring device														
Conductivity cell pH-sensor (if existing)														
Accessories														

**Note: Each maintenance task should be documented with a date and the initials of the person performing the task.  
 Copies should be made of the maintenance log before the first entries are made!**

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## 1. Preserving the system

### 1.1 General points



After three months at most the preserving agent should be flushed out and replaced if necessary.

When the system is shut down for more than thirty days, it must be preserved.

When it is put into operation again, please follow the procedure described in chapter E of this operating manual.



The preserving solution contains 1.5% of sodium bisulphite and 20% of glycerine.

The preserving solution should be fed into the pipelines in accordance with the directives that apply in the given case.

### 1.2 Preserving options

- Sodium bisulphite: preserving without antifreeze
- Sodium bisulphite + glycerine: preserving with antifreeze, to a temperature of - 10° C

### 1.3 Materials required

- Preserving tank with locking valve
- 3 connecting tubes
- Preserving/neutralisation chemicals: sodium bisulphite (art. no. 530014) and glycerine (art no. 530024)
- Protective clothing (goggles, gloves, apron)

### 1.4 Connecting the preservation tank

- ☞ Switch off system
- ☞ Close the feed water inlet

#### 1.4.1 For systems without cleaning connections

- ☞ Set up the preservation tank at a height greater than that of the system, so as to ensure that the preserving solution will flow into the RO system without any difficulty
- ☞ Close off the valve on the preservation tank
- ☞ Detach the feed water inlet, the permeate pipe and the concentrate pipe of the RO system



- ☞ Dismantle fine filter 1F01 (5µm)
- ☞ The connecting tubes should be connected as follows:
  - Connect the outlet from the preservation tank with the union "filter outlet"
  - Set up a tube connection between the preservation tank and the concentrate outlet of the RO system
  - Set up a tube connection between the preservation tank and the permeate outlet of the RO

#### 1.4.2 For systems with cleaning connections (optional)

- ☞ Set up the preservation tank at a height greater than that of the system, so as to ensure that the preserving solution will flow into the RO system without any difficulty
- ☞ Close off the valve on the preservation tank
- ☞ The connecting tubes should be connected as follows:
  - Connect outflow of cleaning system with 1V10 cleaning connection
  - Set up a tube connection between preservation tank and 1V12 concentrate cleaning connection
  - Set up a tube connection between preservation tank and 1V11 permeate cleaning connection

#### 1.5 Preparing the preserving solution



Danger

##### **Danger of fumes!**

**In handling cleaning chemicals, please have regard to the general instructions for avoidance of accidents and to what is stated in the relevant safety data sheet.**

**When pouring the chemicals into the preservation tank, protective clothing should be worn – protective goggles, rubber gloves and rubber apron**

- ☞ Charge the preservation tank with a quantity of soft water as specified in the table (see 1.7, depending on the size of the system).
- ☞ Check that the connections are adequately sealed.
- ☞ Prepare the preserving solution by adding the chemicals (as shown on table) to the preservation tank.

**Important:**

**Chemicals should be added with caution – stir constantly!**

### 1.6 Executing the preservation procedure

- ☞ Open the 1V06 concentrate control valve and the 1V05 pressure control valve completely
- ☞ Put the three-way ball valves (1V11 and 1V12) in "Flushing" position\*
- ☞ Open the 1V10 tap\*
- ☞ Open the locking valve on the preservation tank
- ☞ Switch the RO system to "Disinfection" operating mode (see control manual)

**Warning:**

**There are no safety facilities when the system is running!**

- ☞ Let the preserving solution circulate for ten minutes
- ☞ Switch off the RO system (see control manual)
- ☞ Close the locking fittings on the preservation tank
- ☞ Close the 1V10 tap\*
- ☞ Put 1V12 three-way ball valve in "Operational" position\*
- ☞ Detach the tube connections
- ☞ Close off feed water input and permeate and concentrate outlets with sealing disks
- ☞ Dispose of preserving solution (see 1.1 "General points")

\* Only for systems with cleaning connections

### 1.7 Composition of the preserving solution

	Permeate output of the system l/h	Soft water supply l	Sodium bisulphite powder g	Glycerine l
Art. no.			530 014	530 024
Conc. of chemicals			97%	86,5%
	20 - 50	10	100	1,6
	60 - 170	15	150	2,5
	220 - 450	20	200	3,3
	600 - 1000	30	300	4,9
	1500 - 2500	60	600	9,8
	3000 - 5000	80	800	13,0
	- 10.000	160	1600	26,0
	- 15.000	240	2400	39,0
	- 20.000	320	3200	52,0
	- 30.000	750	7500	78,0



The pH value of the preserving solution is 4 or thereabouts.

## 2. Cleaning the system

### 2.1 General points

If the conductivity of the permeate rises by as much as 15%, or if the permeate output falls by as much as 10%, it is recommended that the membrane modules should be cleaned.

There is a distinction to be made between two types of cleaning:



- 1.) Acid cleaning to remove carbonate and iron deposits
- 2.) Alkali cleaning to remove organic impurities

**Generally cleaning should be carried out in the following sequence:**

**alkali → acid → alkali**

**Please discuss the type of cleaning with the manufacturer before carrying it out.**



**Cleaning solution should be disposed with in adherence to the local or country-specific requirements!**

### 2.2 Materials required

- Cleaning tank with locking valve
- Three connecting tubes
- Universal indicator paper, pH 0-14 (art. no. 630074)
- Preserving/ neutralising chemicals (see 2.6 "Cleaning solutions")
- Conductivity measurement device for comparative measurement
- Protective clothing (goggles, gloves, apron)

### 2.3 Connecting the cleaning tank

☞ see section 1.4

## 2.4 Preparing the cleaning solution



Danger

### **Danger of fumes!**

**In handling cleaning chemicals, please have regard to the general instructions for avoidance of accidents and to what is stated in the relevant safety data sheet.**

**When pouring the chemicals into the cleaning tank, protective clothing should be worn – protective goggles, rubber gloves and rubber apron!**

- ☞ Charge the cleaning tank with the quantity of soft water specified in the table.
- ☞ Check that the connections are adequately sealed
- ☞ Prepare the cleaning solution by adding the chemicals (as shown on table 2.6) to the cleaning tank.

**Important:**

**Chemicals should be added with caution – stir constantly!**

## 2.5 Executing the cleaning procedure

- ☞ Switch off the system
- ☞ Close the feed water inlet

**Charging the system with the cleaning solution**

- ☞ Put three-way ball valves (1V11 and 1V12) in "Cleaning" position\*
- ☞ Open the 1V10 tap\*
- ☞ Open the 1V06 concentrate control valve and the 1V05 pressure control valve completely
- ☞ Open the locking valve on the cleaning tank
- ☞ Switch the RO system to "Disinfection" operating mode (see control manual)

**Warning:**

**There are no safety facilities when the system is running!**

**Time needed for the cleaning solution to be effective**

- ☞ Let cleaning solution circulate for between **30 and 60 minutes**
- ☞ Switch off RO system (see control manual)
- ☞ Close locking valves on the cleaning tank
- ☞ Dispose of cleaning solution (see 1.1, "General points")

☞ Close 1V10 tap\*

### Flushing out the system

- ☞ Open feed water inlet
- ☞ Switch RO system to "Disinfection" operating mode (see control manual)
- ☞ Flush out the system for **at least 45 minutes**. Here the flushing liquid that emerges should be disposed of a quantity at a time (see 1.1, "General points")
- ☞ Switch off RO system (see control manual)
- ☞ Detach the connecting tubes
- ☞ Reconnect the feed water inlet and permeate and concentrate outlets
- ☞ Put the 1V11 and 1V12 taps back into operating position\*



Warning

**Do not terminate the cleaning procedure until the pH value of the concentrate is the same as the pH value of the feed water.**

\* only for systems with cleaning connections



The temperature of the cleaning solution must not exceed 35° C!  
If the pH value shows no further change between the input and outflow of the cleaning solution, the cleaning procedure may be terminated.

## 2.6 Cleaning solutions

### 2.6.1 Acid cleaning

			<b>Cleaning option 1</b>	<b>Cleaning option 2</b>
	Permeate output of the system l/h	Soft water supply l	Citric acid powder kg	Hydrochloric acid ml
Art. no.			530 015	530 13
Conc. of chemicals			100%	33%
	50 - 250	50	1,0	250
	600 - 1500	100	2,0	500
	2000 - 3500	200	4,0	1000
	4000 - 5000	200	4,0	1000
	6000 - 8000	300	8,0	1500
	10.000 - 15.000	500	10,0	2500
	- 18.000	750	15,0	3750
	20.000 - 25.000	1000	20,0	5000



**The pH value of the preserving solution is 2 or thereabouts. It should not be allowed to fall below this level.**

### 2.6.2 Alkali cleaning

			<b>Cleaning option 1</b>		<b>Cleaning option 2</b>
	Permeate output of the system l/h	Soft water supply l	NaOH-flakes g	Sodium dodecyl sulphate g	HC310
Art. no.			530 027	530 21	530 051
Conc. of chemicals			100%	90%	-
	50 - 250	50	50	15	250
	600 - 1500	100	100	25	500
	2000 - 3500	200	200	50	1000
	4000 - 5000	200	200	50	1000
	6000 - 8000	300	300	75	1500
	10.000 - 15.000	500	500	125	2500
	- 18.000	750	750	190	3750
	20.000 - 25.000	1000	1000	250	5000

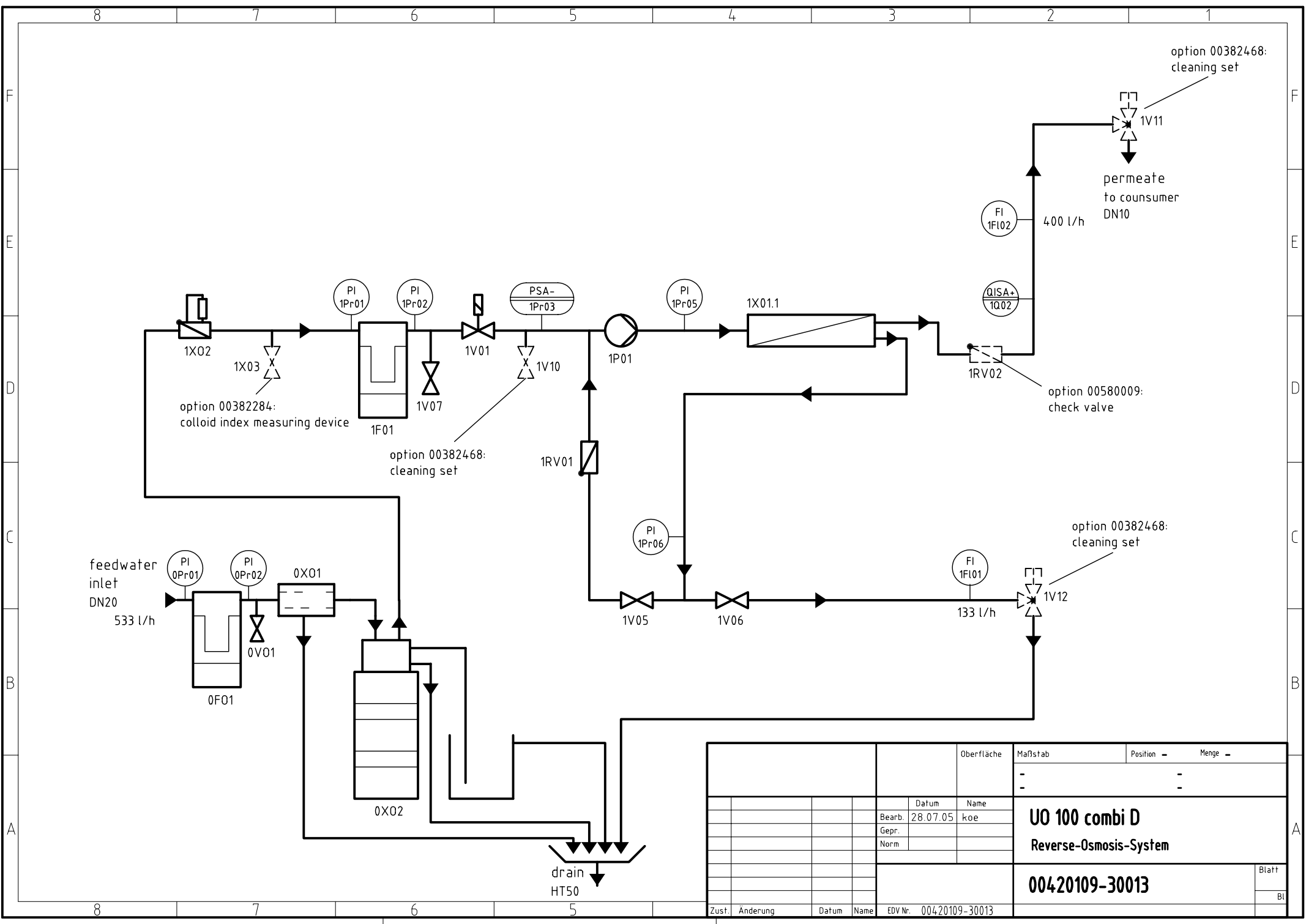


**The pH value of the preserving solution is 12 or thereabouts. It should not be allowed to fall below this level.**

# Appendix

R+I flowchart  
with  
components and spare parts list



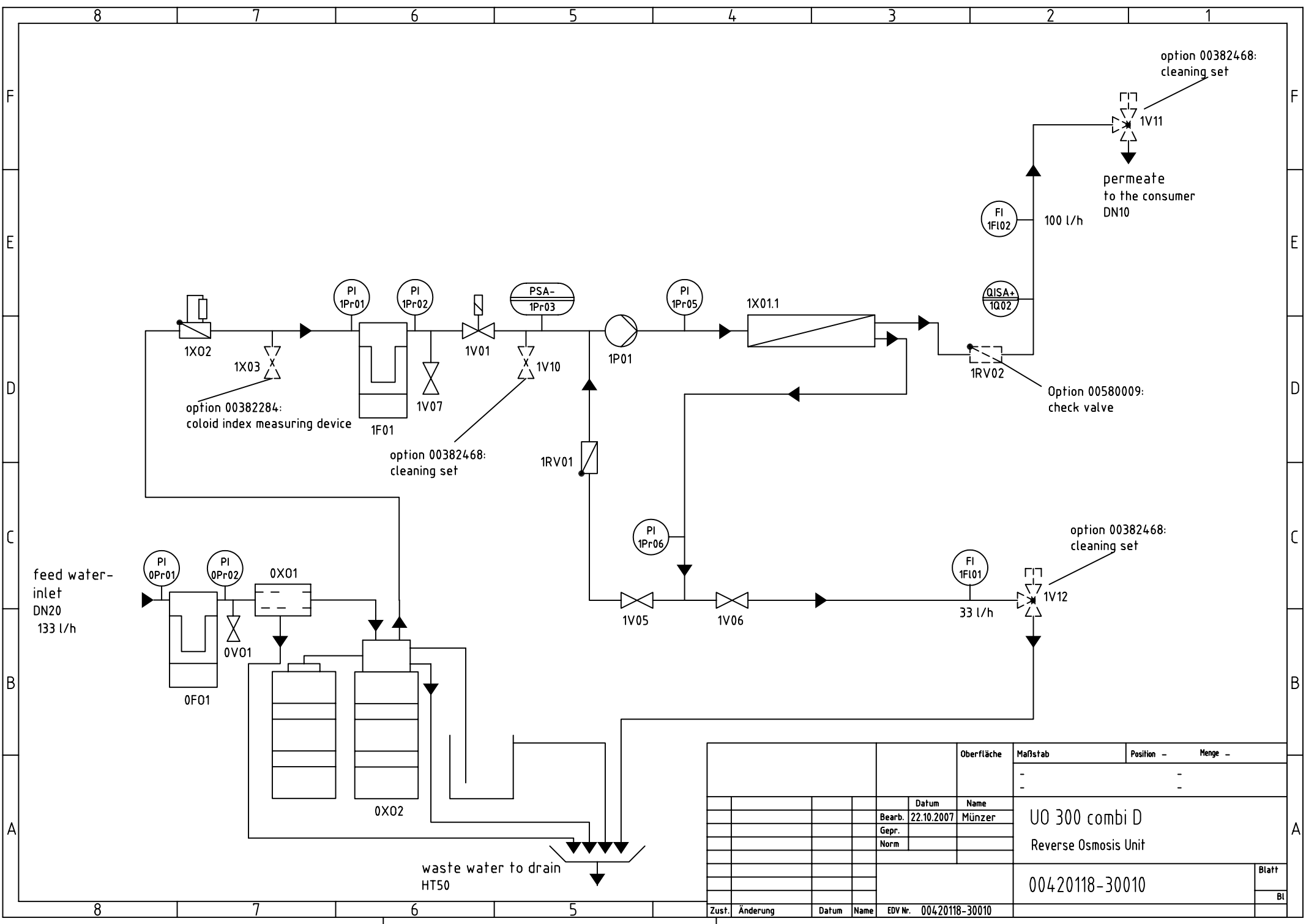


		Oberfläche	Maßstab	Position	Menge
		Datum	Name		
		Bearb.	28.07.05	koe	
		Gepr.			
		Norm			
			<b>UO 100 combi D</b>		
			<b>Reverse-Osmosis-System</b>		
					Blatt
					Bl
Zust.	Änderung	Datum	Name	EDV Nr.	004.20109-30013

<b>UO 100 combi D</b> Code No.: 00420109		<b>Component List</b>	
<b>P+I-No</b>	<b>Code-No</b>	<b>Description</b>	
0F01	00 330 049 00 335 070	filter housing 10", 3/4"IG, blue cup filter cartridge, 10", 100 µm	
0Pr01	00 630 006	pressure gauge filter inlet, Ms, NG63, ¼"h, 0-10 bar	
0Pr02	00 630 006	pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
0V01	00 410 084	sample	
0X01	00 340 003	line separator	
0X02	00 360 039	softener HS-SK 621	
1F01	00 330 049 00 335 014	filter housing 10", 3/4"IG, blue cup filter cartridge, 10", 5 µm	
1FI01	00 580 021	flowmeter concentrate, 60-640 l/h	
1FI02	00 580 021	flowmeter permeate, 60-640 l/h	
1P01	00 390 031	pump 2507 Ms	
	00 640 002	motor 0,55 kW	
1Pr01	00 630 006	pressure gauge filter inlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr02	00 630 006	pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr03	00 600 012	pressure switch FF4-8, ⅜"	
1Pr05	00 630 209	pressure gauge operation pressure, Ms, NG63, ¼"h, 0-25 bar	
1Pr06	00 630 209	pressure gauge concentrate pressure, Ms, NG63, ¼"h, 0-25 bar	
1Q02	00 100 024	conductivity measuring cell permeate	
1V01	00 410 095	solenoid valve, Ms, ½", DN13	
1V05	00 415 054	regulating valve - concentrate recirculation, needle valve VA, ¼"	
1V06	00 415 054	concentrate regulating valve, needle valve VA, ¼"	
1V07	00 410 084	sample	
1X01	00 400 003 00 395 142	vessel, GFK, 2540-1, 25 bar Low pressure element	
1X02	00 370 038	hardness monitor Limitron ¾"	
	00 382 400	control with RO 500	
option 00382468 cleaning set:			
1V10	00 580 098	ball valve PVC, DN15	
1V11	00 405 001	3 way-ball valve, DN10	
1V12	00 405 001	3 way-ball valve, DN10	
further optionen:			
1RV02	00 580 009	check valve PVC, DN10, PN16	
1X03	00 382 284	colloid index measuring device	



<b>UO 250 combi D</b> Code-No. <b>00420084</b>		<b>Component List</b>	
<b>P+I-No</b>	<b>Code-No</b>	<b>Description</b>	
0F01	00 330 049 00 335 070	filter housing 10", 3/4"IG, blue cup filter cartridge, 10", 100 µm	
0Pr01	00 630 006	pressure gauge filter inlet, Ms, NG63, ¼"h, 0-10 bar	
0Pr02	00 630 006	pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
0V01	00 410 084	sampling	
0X01	00 340 003	line separator	
0X02	00 360 039	softener HS-SK 621	
1F01	00 330 049 00 335 014	filter housing 10", 3/4"IG, blue cup filter cartridge, 10", 5 µm	
1FI01	00 580 022	flowmeter concentrate, 20-250 l/h	
1FI02	00 580 022	flowmeter permeate, 20-250 l/h	
1P01	00 390 031	pump 2507 Ms	
	00 640 002	motor 0,55 kW	
1Pr01	00 630 006	pressure gauge filter inlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr02	00 630 006	pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr03	00 600 012	pressure switch FF4-8, ⅜"	
1Pr05	00 630 209	pressure gauge operation pressure, Ms, NG63, ¼"h, 0-25 bar	
1Pr06	00 630 209	pressure gauge pump pressure, Ms, NG63, ¼"h, 0-25 bar	
1Q02	00 100 024	conductivity measuring cell permeate	
1V01	00 410 095	solenoid valve, Ms, ½", DN13	
1V05	00 415 054	regulating valve - concentrate recirculation, needle valve VA, ¼"	
1V06	00 415 054	concentrate regulating valve, needle valve VA, ¼"	
1V07	00 410 084	sampling	
1X01	00 400 003 00 395 146	vessel, GFK, 2540-1, 25 bar Low pressure element	
1X02	00 370 038	hardness monitor Limitron ¾"	
	00 382 400	control with RO 500	
option 00382468 cleaning set:			
1V10	00 580 098	ball valve PVC, DN15	
1V11	00 405 001	3 way-ball valve, DN10	
1V12	00 405 001	3 way-ball valve, DN10	
further optionen:			
1RV02	00 580 009	check valve PVC, DN10, PN16	
1X03	00 382 284	colloid index measuring device	



feed water-  
inlet  
DN20  
133 l/h

option 00382284:  
colloid index measuring device

option 00382468:  
cleaning set

Option 00580009:  
check valve

option 00382468:  
cleaning set

option 00382468:  
cleaning set

permeate  
to the consumer  
DN10

waste water to drain  
HT50

				Oberfläche	Maßstab	Position -	Menge -	
			Datum	Name	UO 300 combi D			
			Bearb.	22.10.2007				Münzer
			Gepr.					
			Norm			Reverse Osmosis Unit		
					00420118-30010		Blatt	
							Bl	
Zust.	Änderung	Datum	Name	EDV Nr.	00420118-30010			

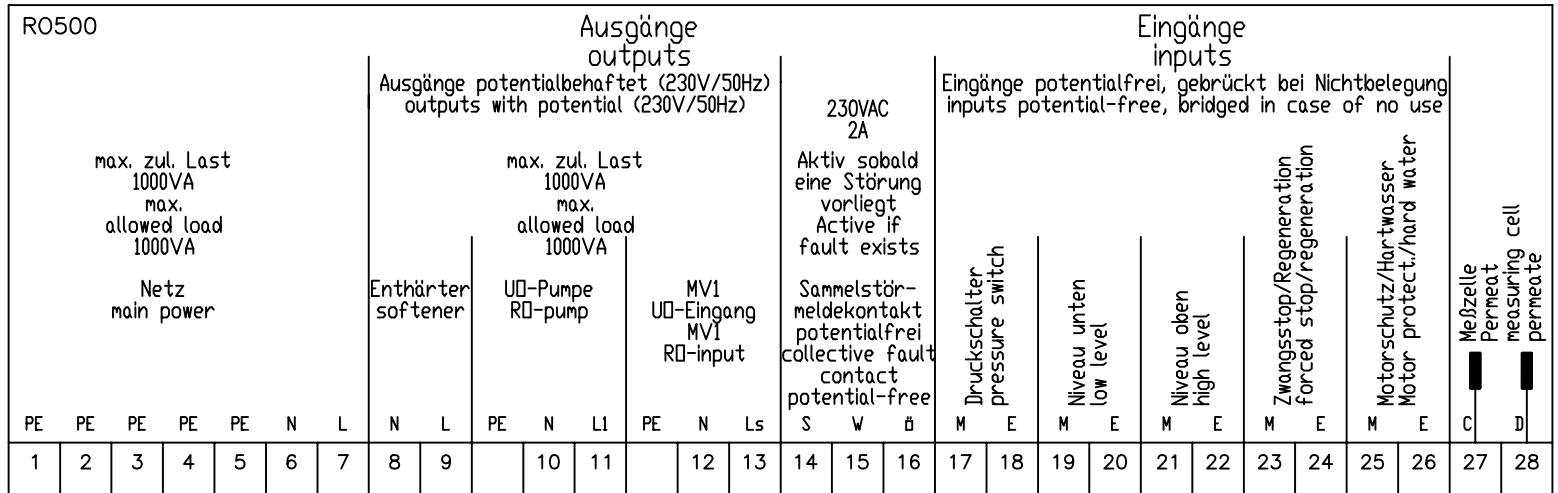
<b>UO 300 combi D</b> Code No.:00420118		<b>Component List</b>	
<b>P+I-No</b>	<b>Code-No</b>	<b>Description</b>	
0F01	00 330 049 00 335 070	filter housing 10", 3/4"IG, blue cup filter cartridge, 10", 100 µm	
0Pr01	00 630 006	pressure gauge filter inlet, Ms, NG63, 1/4"h, 0-10 bar	
0Pr02	00 630 006	pressure gauge filter outlet, Ms, NG63, 1/4"h, 0-10 bar	
0V01	00 410 084	sample	
0X01	00 340 003	line separator	
0X02	00 360 039	softener HS-SK 621	
1F01	00 330 049 00 335 014	filter housing 10", 3/4"IG, blue cup filter cartridge, 10", 5 µm	
1FI01	00 580 026	flowmeter concentrate, 40-400 l/h	
1FI02	00 580 026	flowmeter permeate, 40-400 l/h	
1P01	00 390 156	pump 2539 MS	
	00 640 011	motor 0,55 kW, 230V/50Hz	
1Pr01	00 630 006	pressure gauge filter inlet, Ms, NG63, 1/4"h, 0-10 bar	
1Pr02	00 630 006	pressure gauge filter outlet, Ms, NG63, 1/4"h, 0-10 bar	
1Pr03	00 600 012	pressure switch FF4-8, 3/8"	
1Pr05	00 630 209	pressure gauge operation pressure, Ms, NG63, 1/4"h, 0-25 bar	
1Pr06	00 630 209	pressure gauge concentrate pressure, Ms, NG63, 1/4"h, 0-25 bar	
1Q02	00 100 024	conductivity measuring cell permeate	
1V01	00 410 095	solenoid valve, Ms, 1/2", DN13	
1V05	00 415 054	regulating valve - concentrate recirculation, needle valve VA, 1/4"	
1V06	00 415 054	concentrate regulating valve, needle valve VA, 1/4"	
1V07	00 410 084	sample	
1RV01	00 410 026	check valve, Ms, 3/8"	
1X01	00 400 015 00 395 146	vessel, GFK, 2540-1, 25 bar Low pressure element	
1X02	00 370 038	hardness monitor Limitron ¾"	
	00 382 400	control with RO 500	
option 00382468 cleaning set:			
1V10	00 580 098	ball valve PVC, DN15	
1V11	00 405 001	3 way-ball valve, DN10	
1V12	00 405 001	3 way-ball valve, DN10	
further optionen:			
1RV02	00 580 009	check valve PVC, DN10, PN16	
1X03	00 382 284	colloid index measuring device	



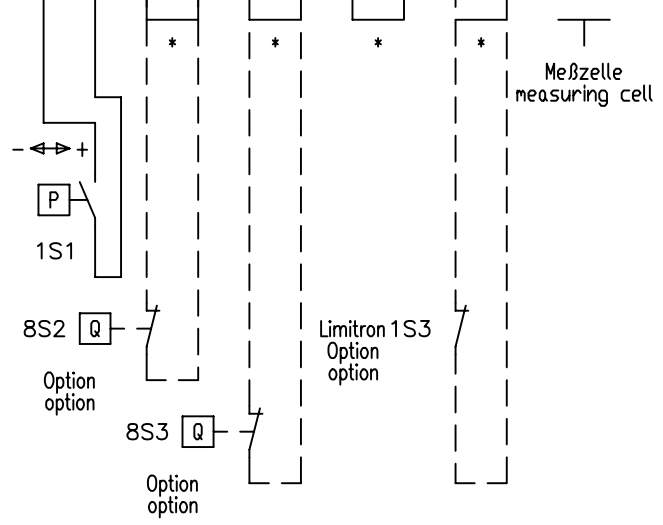
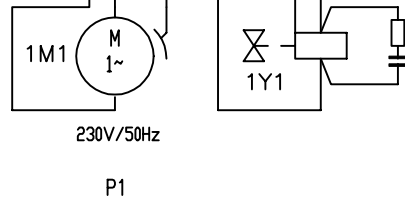
<b>UO 400 combi D</b> Code-No. 00420090		<b>Component List</b>	
<b>P+I-No</b>	<b>Code-No</b>	<b>Description</b>	
0F01	00 330 049 00 335 070	filter housing 10", 3/4"IG, blue cup filter cartridge, 10", 100 µm	
0Pr01	00 630 006	pressure gauge filter inlet, Ms, NG63, ¼"h, 0-10 bar	
0Pr02	00 630 006	pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
0V01	00 410 084	sample	
0X01	00 340 003	line separator	
0X02	00 360 039	softener HS-SK 621	
1F01	00 330 049 00 335 014	filter housing 10", 3/4"IG, blue cup filter cartridge, 10", 5 µm	
1FI01	00 580 033	flowmeter concentrate, 60-640 l/h	
1FI02	00 580 033	flowmeter permeate, 60-640 l/h	
	00 390 031	pump 2507 Ms	
	00 640 002	motor 0,55 kW	
1Pr01	00 630 006	pressure gauge filter inlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr02	00 630 006	pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr03	00 600 012	pressure switch FF4-8, ⅜"	
1Pr05	00 630 209	pressure gauge operation pressure, Ms, NG63, ¼"h, 0-25 bar	
1Pr06	00 630 209	pressure gauge pump pressure, Ms, NG63, ¼"h, 0-25 bar	
1Q02	00 100 024	conductivity measuring cell permeate	
1V01	00 410 095	solenoid valve, Ms, ½", DN13	
1V05	00 415 054	regulating valve - concentrate recirculation, needle valve VA, ¼"	
1V06	00 415 054	concentrate regulating valve, needle valve VA, ¼"	
1V07	00 410 084	sample	
1X01	00 400 015 00 395 146	vessel, GFK, 4040-1, 25 bar Low pressure element	
1X02	00 370 038	hardness monitor Limitron ¾"	
	00 382 400	control with RO 500	
option 00382468 cleaning set:			
1V10	00 580 098	ball valve PVC, DN15	
1V11	00 405 001	3 way-ball valve, DN10	
1V12	00 405 001	3 way-ball valve, DN10	
further optionen:			
1RV02	00 580 009	check valve PVC, DN10, PN16	
1X03	00 382 284	colloid index measuring device	



# Circuit diagram



Anschluß 230V/50Hz  
CEE-Stecker 3x16A  
Supply 230V/50Hz  
CEE-plug 3x16A  
Vorsicherung max. 16A  
Fuse protection max. 16A



Bei ext. Beschaltung Brücke entfernen  
Remove bridge in case of external connection

Kopieren oder Weitergabe nur mit unserer schriftlichen Genehmigung gestattet

Revision	Datum	Name		Datum	Name	Anschlußbelegung RO500 Terminals RO500	Projektbez. RO 500	Auftragsnr.	Zeichnungsnr. 382400-01000	Blatt 1 1 Bl.	
a	Symbol RO1000	05.12.00	mue	gez.	02.08.00						Tie
b	Einst. 1M1	18.01.01	Tie	gepr.	13.02.02						Tie
c											



# Control system manual

# **Operating instructions**

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## **RO 500 control system**

### **1. Description of functions**

- normal operation**
- regeneration (emergency shut-down)**
- hard water ( Limitron )**
- disinfection**
- intermittent flushing**
- calibration**
- emergency shut-down**

### **2. Operating parameters**

- description of parameters**
- status and malfunction signals**

### **3. Terminal allocation**

# 1. Description of functions

## Normal operation

Following "**power-on**", the control system starts an initialization cycle with a duration of about two seconds.

During initialization, "88" is displayed and the LEDs are off.

The control system then switches over to normal operation, the display switches to operation "b0" and the green LED lights up.

If it is necessary to fill the tank because of the low level, i.e. both level switches are closed (the unit may also be only be equipped with one level switch: in this case, a jumper must be installed on the low level switch), the solenoid valve will open.

The water pressure is then checked by the pressure switch. If the pressure signal is not available after a preset time (**time\_pressure\_available**), an automatic shut down is initiated and "**E5**" is displayed.

If the pressure signal is received, the pump is started up after a preset time (**time\_pressure\_start-up**) and the water conductivity measured is indicated.

This operational status is changed if the upper level switch closes, indicating that the tank is full. In this case, the pump is shut down, "b0" is displayed and the solenoid valve is closed again after a preset time (**time\_displacement**).

If the pressure switch signals low pressure to the control unit with the pump running, the green LED flashes and "**E3**" is displayed until the pressure switch again signals the pressure required.

The control system then switches over to normal operation with the exception that the two signals "normal operation" and "**E3**" are displayed in succession.

If the conductivity exceeds the warning value for five minutes with the pump running, the green LED flashes and the conductivity is displayed alternately with "**E6**" until the conductivity falls below this value.

Normal operation then continues.

If the conductivity exceeds the conductivity alarm limit for five minutes with the pump running, a collective malfunction signal is initiated, the green LED flashes and the conductivity is displayed alternately with "**E7**".

If the alarm limit is exceeded for a further preset time (**time\_cond**), the unit is automatically shut down and "**E7**" is displayed.

Malfunction signals are reset by switching the unit **ON** and **OFF**. The flashing green LED is then lit continuously.

## Regeneration (emergency stop)

The unit can be said to "**regeneration**" or "**emergency stop**" by operating (opening) the appropriate switch. The pump is then shut down immediately and the solenoid valve is operated after a time delay of two seconds. The green LED continues to be lit and (**b1**) is displayed. If the switch is closed, the control unit is switched back to normal operation. This is the case if an individual water softening unit is installed upstream from the unit.

## Hard water (Limitron)

If the "**hard water**" or "**Limitron**" switch is operated (opened), an emergency shut-down is initiated and "**E2**" is displayed

### **Disinfection** *(to be carried out only by specialist personnel)*

To switch to the "disinfection" operating mode, press the button before switching the power on and keep the button pressed during initialization, while "88" is displayed. After five seconds, "b3" is displayed, the solenoid valve is switched on, a collective malfunction signal is initiated and the red LED starts to flash slowly. If you have released the button in the meantime, the pump will be started up after a further time delay of five seconds and the conductivity value will be displayed alternately with "b3".

To switch back to normal operation, press the push button again. The pump will be shut down immediately and the solenoid valve will be closed after two seconds, if applicable.

**Caution:** in this mode of operation, no safety functions are in operation. The unit must only be operated under close supervision. Make sure that the water pressure is correct in order to prevent damage to the pump.

### **Intermittent flushing**

If the solenoid valve is switched off for a preset time in normal operation (**time\_int\_flush\_start**), in other words if the tank is still full, the control system will switch to "intermittent flushing". This is similar to normal operation except that the level switches have no effect and the objective is to fill the tank. "b2" is displayed and, after the pump has been started up, the conductivity value is displayed alternately with "b2". Intermittent flushing continues for a preset time (**time\_int\_flush\_run**). When this time has elapsed, the pump is shut down immediately, the solenoid valve is switched off after two seconds and the control system switches back to normal operation.

The intermittent flashing function can be deactivated by setting the preset time (**time\_int\_flush\_start**) to 0.

### **Calibration** *(to be carried out only by specialist personnel)*

To switch to the "calibration" mode, press the push button before switching the power on and keep the button pressed during initialization while "88" is displayed. After five seconds, "b3" is displayed, the solenoid valve is switched on, a collective malfunction signal is initiated and the red LED starts to flash slowly. The unit is switched to disinfection. If you keep the push button pressed for a further period of five seconds, the pump is switched on and the conductivity value is displayed alternately with "C". The green LED is also lit.

Each time you press the button, the conductivity offset value is increased by 1  $\mu\text{S}/\text{cm}$ . When you reach the offset + 20  $\mu\text{S}/\text{cm}$ , the offset will be switched to - 20  $\mu\text{S}/\text{cm}$  the next time you press the push button. Each time you press the button, the current conductivity value is displayed immediately and the current offset is saved. The offset is saved irrespective of whether mains power is available.

You can only end calibration operation by switching the power off.

It is only necessary to use the calibration function if the conductivity measuring cell is replaced.

### **Emergency shut-down**

Emergency shut-down means that the pump is shut down immediately and the solenoid valve is switched off with a delay of two seconds. The corresponding malfunction signal "E" is displayed and the green LED flashes rapidly.

An emergency shut down can only be reset by switching the power off.

## 2. Operating parameters

Operating parameters can only be programmed by the manufacturer!

Parameter	Resolution	Limits		Settings set by manufacturer
		min.	max.	
TIME_PRESSURE_AVAILABLE	0.1 sec.	0.1 sec.	9.9 sec.	<b>9.9 sec.</b>
TIME_PRESSURE_STARTUP	0.1 sec.	0.1 sec.	9.9 sec.	<b>9.9 sec.</b>
TIME_DISPLACEMENT	1.0 sec.	1.0 sec.	250 sec.	<b>60 sec.</b>
CONDLIM	0.5 µS/cm	1 µS/cm	99 µS/cm	<b>50 µS/cm</b>
CONDWARN	0.5 µS/cm	1 µS/cm	99 µS/cm	<b>40 µS/cm</b>
TIME_COND	1.0 min.	1.0 min.	250 min.	<b>5 min.</b>
TIME_PRESSURELOW	0.1 sec.	0.1 sec.	9.9 sec.	<b>1.0 sec.</b>
TIME_INT_FLUSH_START	1.0 h	1.0 h	250 h.	<b>24 h</b>
TIME_INT_FLUSH_RUN	1.0 min.	1.0 min.	99 min.	<b>15 min.</b>

Parameters which are set to 0 are disabled.

### Description of parameters

TIME\_PRESSURE\_AVAILABLE Time from switching on valve to malfunction signal "E5".

TIME\_PRESSURE\_STARTUP Time from pressure detection (pressure switch ON to pump start-up).

TIME\_DISPLACEMENT Time from pump shut-down to switching off solenoid valve..

CONDLIM Conductivity limit at which malfunction signal "E7" is displayed after a delay of 5 min., alternately with the conductivity value.

CONDWARN Conductivity limit at which warning "E6" is displayed after a delay of 5 min., alternately with the conductivity value.

TIME\_COND Time between exceeding conductivity limit and shut-down of unit with continuous "E7" signal.

TIME\_PRESSURELOW Time during pump operation before malfunction "E3" (low pressure) is signalled with the pressure switch off.

TIME\_INT\_FLUSH\_START Time before intermittent flushing is started with the solenoid valve off (tank full).

TIME\_INT\_FLUSH\_RUN Duration of intermittent flushing programme.

## 2. Status and malfunction signals

Signal	Description
<b>88</b>	signal during initialization.
<b>b0</b>	normal operation, " <b>tank full</b> " if the pump is not switched on (normally when the tank is full
<b>b1</b>	<b>"emergency stop/regeneration"</b>
<b>b2</b> running	<b>"intermittent flushing"</b> displayed alternately with the conductivity value when the pump is running
<b>b3</b>	<b>"disinfection"</b> displayed alternately with the conductivity value when the pump is running
<b>C</b>	<b>"calibration"</b> displayed alternately with the conductivity value
<b>E2</b>	<b>"hard water"</b> or Limitron emergency shut-down, if the appropriate switch is operated
<b>E3</b>	malfunction signal if no pressure is measured for a certain time with the pump running. <b>"low pressure"</b>
<b>E4</b>	<b>"low pressure"</b>
<b>E5</b>	<b>"low pressure"</b> signal if no pressure is measured for a preset time after switching on the solenoid valve.
<b>E6</b>	<b>"conductivity warning"</b> signal if the conductivity warning limit is exceeded for 5 minutes; displayed alternately with other operating signals
<b>E7</b>	<b>"conductivity alarm"</b> signal if the conductivity alarm limit is exceeded for 5 minutes; displayed alternately with other operating signals After a further time delay, the unit is shut down and this signal is displayed continuously.



### 3. Terminal allocation

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
PE	PE	PE	PE	PE	N	L1	N	L1	N	L1	N	L1	NO	C	NC												
				mains 230V			soft. 230V		pump 230V		valve 230V		STO			PS	LLEV	HLEV	REG	MOT	co nd. sensor						

x 1	PE	earth
x 2	PE	earth
x 3	PE	earth
x 4	PE	earth
x 5	PE	230V AC power supply, earth
x 6	N	230V AC power supply, neutral
x 7	L1	230V AC power supply, phase conductor 1
x 8	N	230V AC power supply for softener, neutral
x 9	L1	230V AC power supply, phase conductor 1 with 6.3A slow fuse
x 10	N	pump motor P1, neutral
x 11	P1	pump motor P1, normally open contact with 6.3A slow fuse
x 12	N	solenoid valve MV1, neutral
x 13	MV1	solenoid valve MV1 normally open contact with 6.3A slow fuse 230V/
x 14	STO NO	collective malfunction signal contact ZLT, 230V AC, 2A, normally open – floating
x 15	STO C	collective malfunction signal contact ZLT, 230V AC, 2A, changeover contact - floating
x 16	STO NC	collective malfunction signal contact ZLT, 230V AC, 2A, normally closed, floating
x 17	PS	pressure switch input 24V DC, 10mA
x 18	PS earth	pressure switch -earth
x 19	LLEV	low level switch input 24V DC, 10mA
x 20	LLEV earth	low level switch - earth
x 21	HLEV	high level switch input 24V DC, 10mA
x 22	HLEV earth	high level switch - earth
x 23	REG	regeneration (emergency stop) - input 24V DC, 10mA
x 24	REG earth	regeneration (emergency stop) – earth
x 25	MOT	motor circuit breaker (hard water, Limitron)- input 24V DC, 10mA
x 26	MOT earth	motor circuit breaker (hard water, Limitron)- input
x 27	COND sensor	conductivity sensor input
x 28	COND sensor earth	conductivity sensor earth

# Operating Instructions for Softener

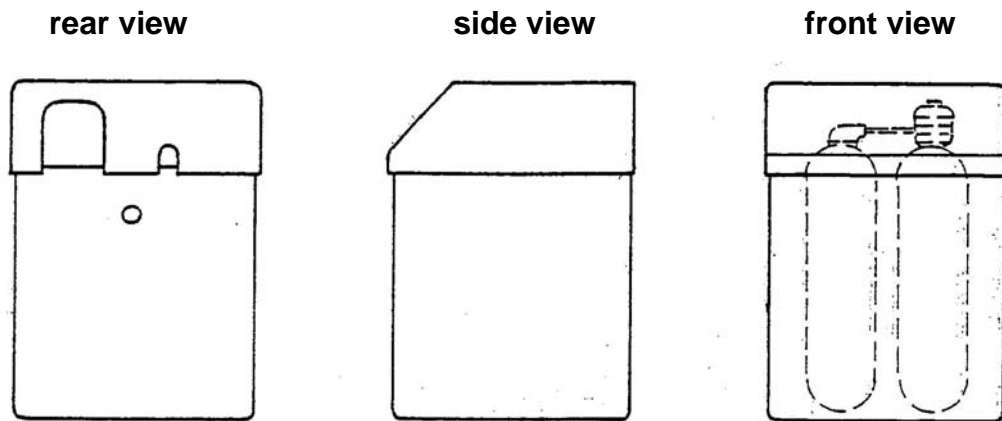
## SoftenerType HS SK

Fully automatic duplex unit with water meter control, for the softening of clear, iron free and manganese-free drinking water by means of cation exchange.

Corrosion-proof version with central control valve mounted on top, brine tank with brine valve, and cover.

Regeneration is carried out in the counter-current method resulting in very low salt consumption.

The unit needs no electricity.



Technical Data			<b>613</b>	<b>618</b>	<b>621</b>
flow rate at 1,2 bar pressure loss	m <sup>3</sup> / h		1,2	1,3	1,5
capacity at 20° dH	m <sup>3</sup> / Reg		0,5	0,6	0,8
salt consumption	kg/ Reg		0,5	0,75	1
brine reserve	kg		25	27	36
operation pressure min./ max.	bar		2,5/7	2,5/7	2,5/7
max. water temperature	°C		30	30	30
max. ambient temperature	°C		40	40	40
time of regeneration	min.		11	11	11
water connection	R		¾"	¾"	¾"
connection rinse water	R		½"	½"	½"
dimensions:					
height	mm		530	700	775
width	mm		360	360	360
depth	mm		360	360	360
code-no:			<b>360 001</b>	<b>360 038</b>	<b>360 039</b>

## Technical Data HS SK 621

tanks:	6x21" (SFC) composite
flow rate:	maximum - 1,5m <sup>3</sup> /h continuously - 1,2 m <sup>3</sup> /h
pressure:	minimum 2,5 bar maximum 7,0 bar
temperature:	max. 30°C
meter gearing:	2-1-5-4 (600 gallons/2280 litres)
regeneration gearing:	2-2-2-2 (1l/minutes)
salt consumption:	ca. 40 litres/regeneration
regeneration:	downflow
service:	upflow

disc no.:	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
dH°	4	8	11	15	19	23	26	30
l/regeneration	2280	1140	760	570	456	380	325	285

When using a **LOW FLOW METER NOZZLE** the capacity between regenerations will be reduced by 50%.

The hardness (dH°) will be doubled.

### Start up

When you have completed installation, the tanks must be filled with water and the unit started as follows:

- 1 Inlet-outlet and bypassvalves must be closed.
- 2 To allow tanks to be filled with water slowly, open inletvalve a fraction.
- 3 In order to rinse and air the tanks, place the black dot in the "Backwash" position by pressing the center of the cap and turning it with a phillips scwdriver.  
(The black dot is interchanged with a diminutive nob model HT).
- 4 Service position is obtained by placing the black dot on 6-or 12 o'clock.
- 5 Open inlet-and outletvalve completely.  
Keep bypassvalve closed and check that the brinevalve stops waterflow, at the proper water level.
- 6 Add SALTTABLETS until water is covered.  
(Do not use rock salt).
- 7 The unit is now in operation and produces soft water.

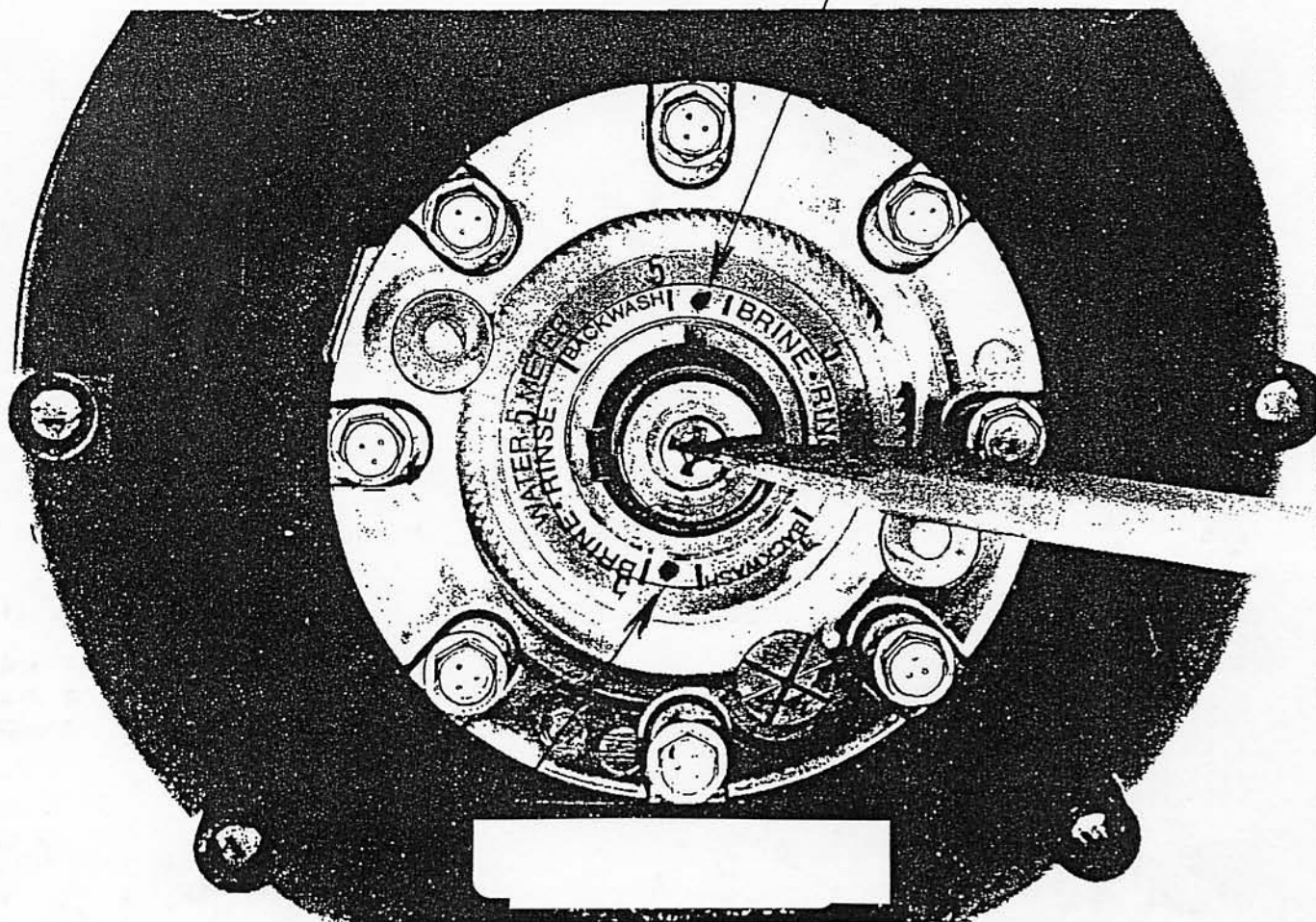
### Maintenance

- 1 Sufficient salttablets must always be available in the tank.
- 2 Salttablets must under no circumstances enter the brinewell.
- 3 Use salttablets, do not use rock salt.
- 4 Inlet-and outletvalves must be open at all times.  
Bypassvalve must be completely closed.
- 5 Check water occasionally for proper performance of unit.
- 6 In case of malfunction please call your serviceorganisation.

Start of operation, see pos. 3 and 4

Service position

12,00 oclock



Service position

6,00 oclock

Depress the demand override actuator with a phillips screwdriver. Turn clockwise until actuator makes contact with the black dot on control disc. Advance the black dot until it is in position "BACK-WASH" - in order to rinse and air the tanks.

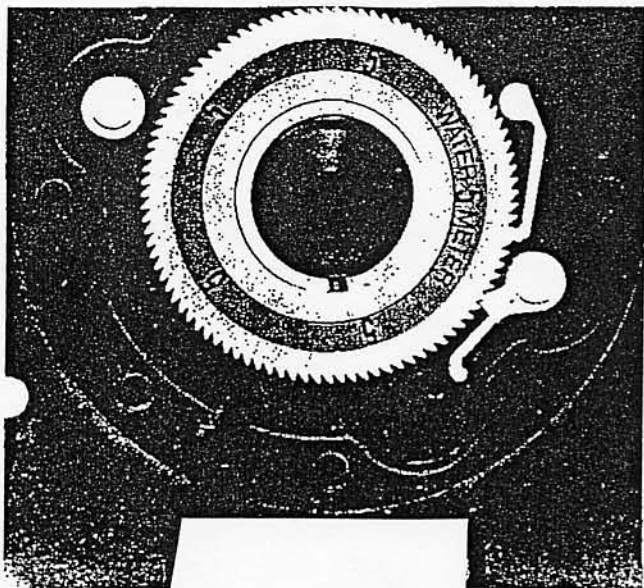
NON-ELECTRIC WATER CONDITIONING EQUIPMENT

## CHANGING WATER METER DISC

The only adjustment necessary when installing a Water Conditioner is to install the proper Water Meter Disc which corresponds to the compensated hardness of the water. The following illustrations show how to perform this. Before attempting this be sure to depressurize unit.

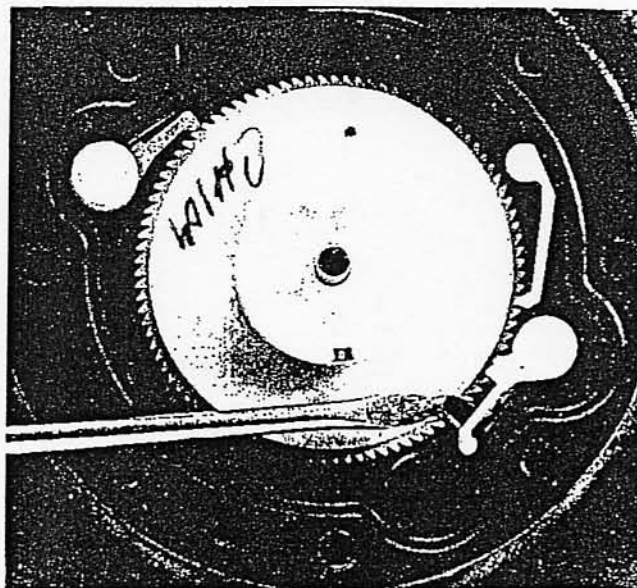
Remove 8 screws and lift off cap

FIG. 1



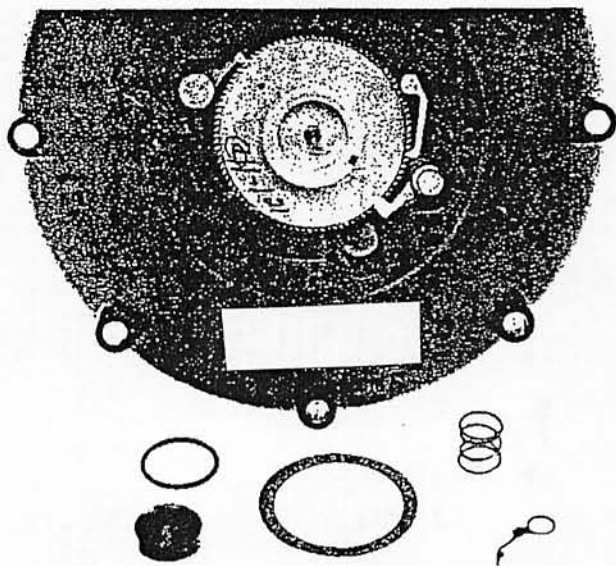
Remove balance piston, spring and O-ring that are located directly in the center. Lift out meter disc.

FIG. 2



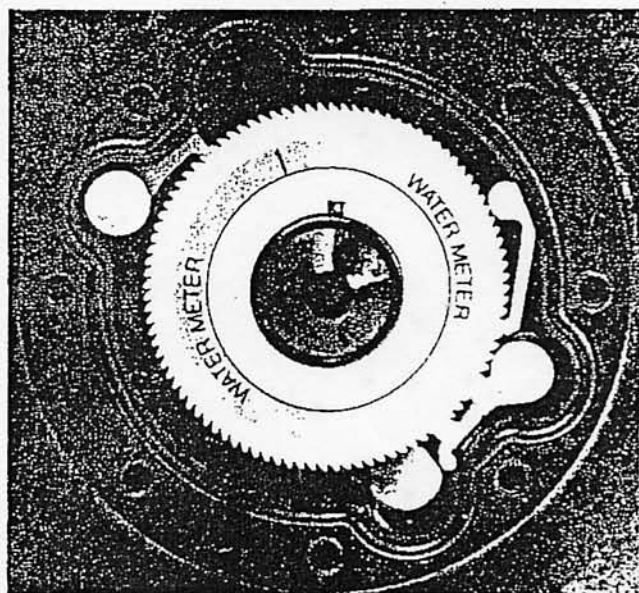
Lift out meter drive pawl as shown with small screwdriver by sliding up shaft.

FIG. 3



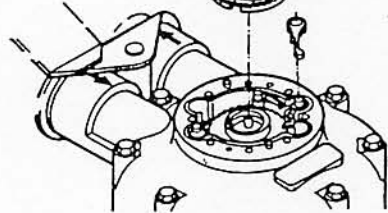
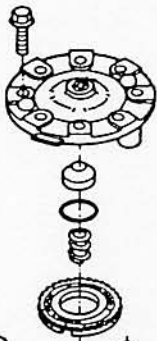
The cap area will look like this once all the parts necessary to remove have been removed.

FIG. 4

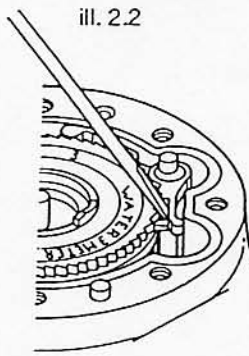


Install the new meter disc, O-ring, spring and balance piston in that order. If meter disc is not sitting flat on the control disc, rotate until it seats itself. Then install the meter drive pawl.

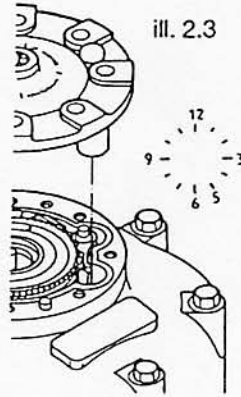
ill. 2.1



ill. 2.2



ill. 2.3

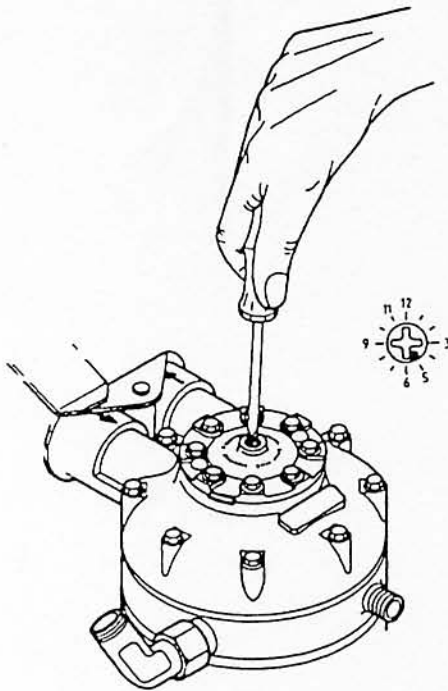


## 1.1 Changing the hardness section disc

- Unscrew cover of control head (hexagon screws SW AF 1/4").
- Take out plastic mushroom with O-ring and spring.
- Exchange hardness section disc (WATER-METER). Take care that the old hardness section disc is taken out carefully and the remaining parts of the control device are left in their functioning positions.
- When introducing the new hardness section disc press the upper detent pawl with a screw driver to the side. See ill. 2.2.
- Reinstall spring and plastic mushroom with O-ring and screw on cover. The projecting pivot underneath the cover has to be in position 5.00 o'clock. See ill. 2.3.

## 2. Deaeration of Softener

- With closed drain slowly open water inlet.
- Press hexagon screw in the middle of the control head downwards with a screw driver (so that the control plate follows) and turn in clockwise direction so far until the small tappet of the screw is positioned at 5.00 o'clock (or 11.00 o'clock). Air and water have to penetrate from the regenerating drain hose.
- Wait until only water and no more air penetrates from the regenerating drain hose. Now the first cartridge is deaerated.
- Turn hexagon screw in the same way farther to position 11.00 o'clock (or 5.00 o'clock) and deaerate the second cartridge in the same way.
- Turn hexagon screw to position 12.00 o'clock (or 6.00 o'clock). No more water may penetrate.



## 4. Filling with regenerating salt

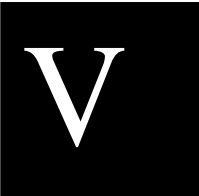
Only use unadulterated boiled (granulation 8 to 15 mm, or as tablets) which is marked as regenerating salt for softeners.

- Fill regenerating salt into the container.

For the first filling a 25 kg packing has to be used. For further operation it is sufficient to fill in so much salt that the water level (height approx. 150 mm) is always covered.

During the first filling of salt excess water may drain over the safety drain.





# Operating Instructions for Hardness Monitor

## Limitron

Automatic hardness monitoring unit for installation after water softeners in connection with the RO controller.

The unit is designed for continuously monitoring the soft water quality without consumption of neither chemicals nor water. The 'hard water' signal is displayed on the control panel of the reverse osmosis unit and transmitted to a floating changeover contact for collective malfunction alarm.

### Design features:

- differential pressure valve
- hardness sensor on a resin expansion/shrinkage base
- replacement sensor
- shut-off valves
- connecting tubes
- transmitter with Reed contact

### Technical Data:

flow rate	min.	l/h	25	200	500	1500	3000
	max.		2500	7000	12000	18000	25000
nominal width (connection)			¾"	1"	1 ¼"	1 ½"	2"
pressure loss max.		bar	0,2				
change-over contact			floating - max.load 50V DC/AC 0,15A 3W				
feed water pressure max.		bar	6				
feed water temperature min./max.		°C	5/35				
ambient temperature max		°C	40				
Item-No:			370038	370069	370044	370070	370063

### Replacement Parts

- Item no.        370031     *limitron* hardness sensor  
 Item no.        370034     *limitron* head

## Mode of Operation

The differential pressure valve which is installed in the soft water line creates a slight difference in the water pressure. Therefore part of the water passes through a bypass and the hardness sensor which is mounted there before return to the main stream.

In case of hard water leakage the sensor will be charged which makes the special resin contained therein shrink. A potential-free contact is used to shut-off the reverse osmosis unit.

## Mounting

- Install hose and fittings in soft water line
- Observe direction of water flow!
- Mount PVC panel vertically to wall nearby.
- Connect hoses as shown on enclosed drawing.

## Electrical connection

- Control RO 500: wire white and green terminal 25 and 26.
- Control RO 1000: wire white and green terminal 25 and 26.
- Control RO 2000: wire white and green terminal 39 and 40.
- Control RO 5000: wire white and green terminal 43 and 44.

## Start-Up

- Make sure that soft water is available.
- Slowly open both shut-off valves and check that joints do not leak.

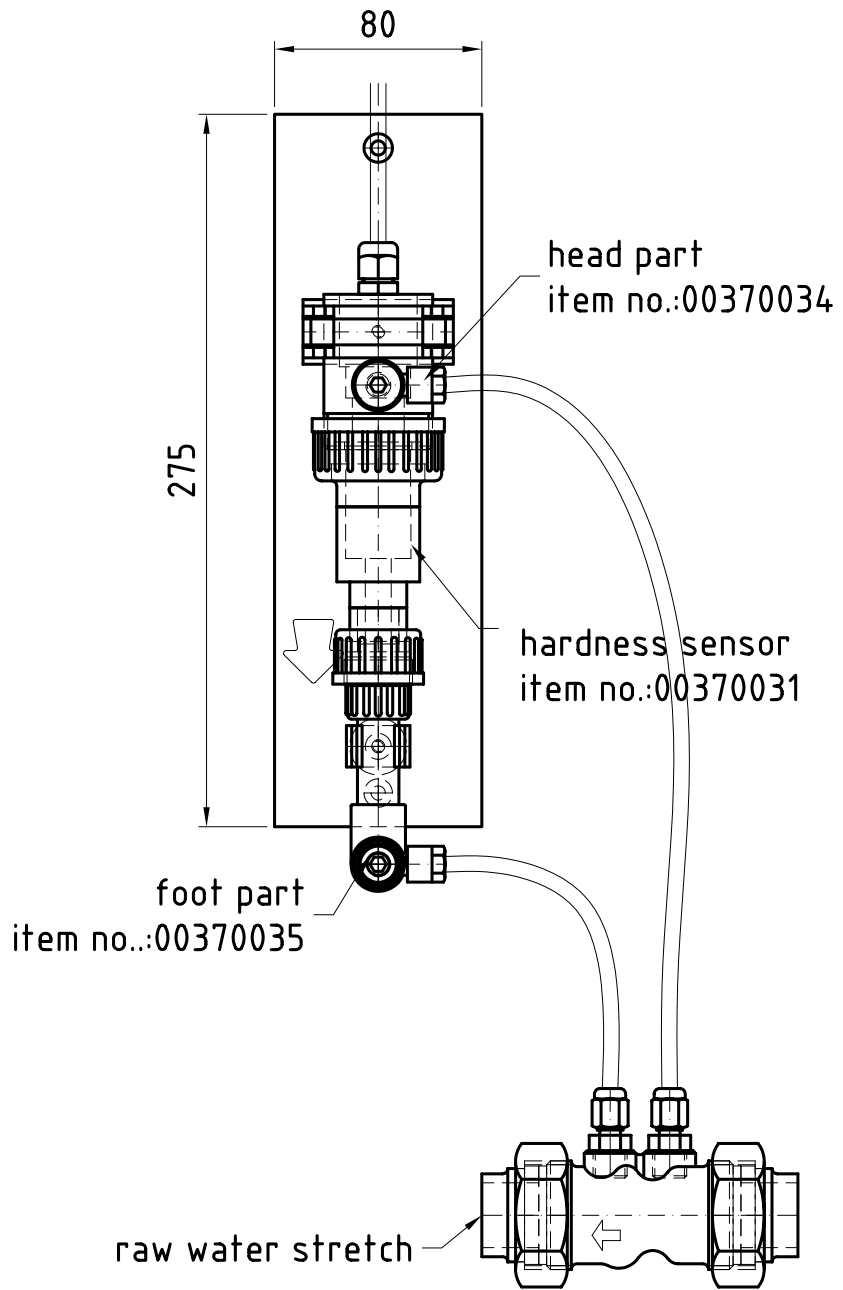
## What to do in case of 'hard water' alarm

- Close shut-off valves (angle valves) at top and bottom.
- Unscrew and exchange sensor.
- Before re-start make sure that soft water is available. Do not open inlet valve to *limitron* if soft water is not available.

**Attention:** The replacement sensor must be rinsed with soft water before installation.  
It should be kept in soft water or permeate during storage.

## Maintenance:

Sensor must be changed one time a year!



Allgemein-Toleranzen DIN ISO 2768 - mK		Oberfläche	Maßstab 1:2	Position	Menge
Bearb.	Datum 21.07.2004	Name	Hardness Control Limitron		
Gepr.		Münzer			
Norm					
			00370038-50100		Blatt
Zust.	Änderung	Datum	Name	EDV Nr. 00370038-50010	Bl