Operating Instructions

Reverse-Osmosis-Systems
UO 100/300/400/500 W/S

CE

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Overview of contents

Contents of Chapter A

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.

Conventions / abbreviations:

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

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

feed water input = Permeate output + concentrate output

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

$$\textbf{Desalinization rate [\%]} = \left[1 - \frac{Cy_{\text{permeate}}}{Cy_{\text{raw water}}}\right] \bullet 100\%$$

3.3 Temperature dependency of permeate output

Danger

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:

Permeate output at X °C = Rate output • 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

Danger

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.

Caution

- **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.

Contents of Chapter C

1.Technical data

System		UO 100 W/S	UO 300 W/S	UO 400 W/S	UO 500 WS
Code No.		385 281	385 283	385 285	385574
Control		RO 500			
Feed water specification					
Feed water pressure min./max.	bar	2/6			
Pressure fluctuations (limit)	bar	± 0.5			
Temperature min./max.	°C	5/35			
Connections					
Feed water	DN	3/4" female thread			
Permeate	DN	10			
Concentrate	DN	10			
Power consumption	kW	0.55			
Power connection	V/Hz	230/50			
Protection type		IP54			
Output data					
Permeate outlet max.	l/h	100	300	400	500
Concentrate min.	l/h	33	100	133	167
Permeate counterpressure max.	bar	0.3; prevent permeate backflow!			
Recovery	%	75			
Salt rejection rate	%	97			
Dimensions and weights					
Dimensions (HxWxD)	mm	1510x500x320			
Weight approx.	kg	46	56	71	73
Environmental data					
Max. ambient temperature	°C	40			
Relative humidity (air)		<95%, non-condensing			

Systems are designed for softened 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 °

2. Usage limits

Caution

In order to attain the life span of 3 years calculated for the membranes, reverse osmosis installations must be supplied, in accordance with the installation type, with softened water (types ND, KR, e.g.) or tap water with stabilised hardness level (type AS, e.g.) and run in compliance with the German Drinking Water Regulation and the specifications below. Membranes are wearing parts. The degree of wear depends on the feed water quality and the operating conditions.

Parameter	Unit	Limit
Free chlorine *	mg/l	not detectable*
Iron **	mg/l	0.2
Manganese **	mg/l	0.05
Silicate ***	mg/l	25
SDI [4]	-	3
pH level during operation [5]		3.6-9.5
pH level during cleaning		2-12

The feed water must be free from substances that damage the membrane. These are in particular:
- oxidants (e.g. free chlorine, ozone, hydrogen peroxide)
- surfactants (especially if cationic)
- biocides and inhibitors
- natural organic matter (NOM)

Additionally, the operating parameters for the reverse osmosis installations given in chapter C (Technical Data) apply.

If the UP feed water is softened, the soft water quality is to be observed. If antiscalant is added for hardness stabilisation (i.e. when iron, manganese and silicate are stabilised at the same time), the manufacturer's specifications must be complied with. If necessary, the pH or the permeate output must be adjusted.

* Free chlorine (oxidants) corrodes the plastic membrane, especially if metal ions are present. This attack is irreversible and will cause a decrease of the salt retention rate while increasing the permeate conductance. This is why the feed water of the UP installation should not contain any free chlorine.

** Iron/manganese can be present in a dissolved or undissolved state. Undissolved iron or manganese should be removed by filtration. Dissolved iron/manganese can be oxidised and then removed by filtration or stabilised, for example, by means of an antiscalant. Iron/manganese deposits on the membranes can generally be removed by chemical cleaning.

*** Silicate may form solid deposits on the membranes which are hard to remove. The maximum silicate concentration in the RO concentrate should not exceed 100 mg/l if soft water is used. In RO installations, type KR, the maximum silicate concentration in the RO feed water is 10 mg/l for this reason.

[4] The SDI is a sum parameter. It indicates the degree to which suspended matter will likely form deposits on the membrane. If the SDI > 3, prefiltration must be improved accordingly.

[5] The pH level considerably influences the solubility of many water compounds. It may be necessary to modify the pH level in order to obtain the desired permeate yield or quality.

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 warrantee 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

Softened feed water is fed in through a fine filter (5 µm filter unit) to the circuit pump unit. This unit pumps the water through the semipermeable membranes at high pressure. As a result of the high pressure, some of the water diffuses through the membranes. The result is purified water that is almost completely free of salts, colloids, germs and pyrogens. This water, which is led off, is referred to as the **permeate**. The salts that are held back are continually rejected into the wastewater channel with the **RO concentrate**.
To arrive at a more economical yield and to cause water to flow over the membranes optimally, part of the concentrate is directed back in front of the membranes.

3.4 Short description of the components

Fine filter (1F01)	Protects the RO membranes from impurities (filter fineness 5µm).
Pressure gauge filter outlet (1Pr02)	Display of filter outlet pressure.
Inlet solenoid valve (1V01)	Is always open during permeate production.
Pressure switch (1Pr03)	Monitors the inlet pressure.
Pump (1P01)	Produces the pressure required for the reverse osmosis process.
Pressure gauge operating pressure (1Pr05)	Display of the operating pressure.
Pressure gauge (concentrate pressure) (1Pr06)	Display of the concentrate pressure.
Concentrate regulating valve (1V06)	Used to set the amount of concentrate to be led away.
Flow meter for concentrate (1Fl01)	Display of the RO concentrate quantity.
pressure regulating valve (1V05)	Controls the amount of concentrate directed in front of the pump.
Permeate measurement cell (1Q02)	Measures the conductivity of the permeate. The control system is used to turn off the system if a limit value is exceeded.
Permeate flow meter (1Fl02)	Displays the permeate flow level.
Control system	Monitors and controls all important functions during the operation of the system.

3.5 Options

The options available for this installation/these installations are described in the P&I diagram and in the list of components in the appendix of this manual.

Contents of Chapter D

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

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 presure > 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
- Dosing

should be made according to the circuit diagram.

Contents of Chapter E

1. Placing the system in service

1.1 Qualifications of the commissioning staff


Caution

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 Rinsing out the preservative fluid


Caution

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
- ☞ 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.

1.3 Adjusting the operating parameters

☞ Adjust min. concentrate flow (see chapter C/2) at 1Fl01 with valve 1V06

☞ Adjust permeate flow (see Chapter C/2) at 1Fl02 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.

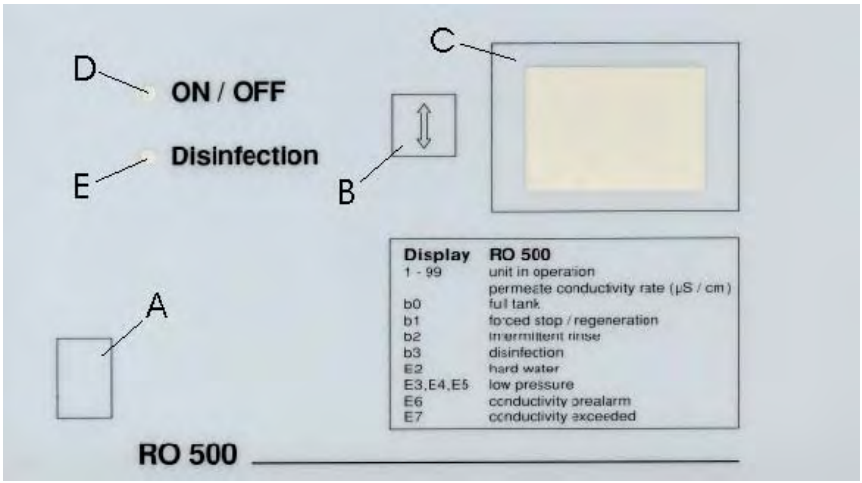
2. Taking the system out of service

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.

Contents of Chapter F

1. Operating and display components



	Benennung	Funktion
A	Main switch	- Turns the system on and off - Störungsquittierung
B	Key button	- Call up desinfection - 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 desinfection (red)	Permanent: → desinfection 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

Operation

Display: **cy**
Input **NV0** (terminal 21,22) closed
Inlet valve 1V01 opened, pump 1P01 in operation
System is producing permeate

Tank full

Display: **b0**
Input **NV0** (terminal 21,22) opened
System is turned off

Discont. rinsing

Display: **b2**
Time-controlled permeate production, if operating state **Tank full** has been active for the set time.

Forced stop

Display: **b1**
Input **REG** (binding post 23,24) opened
System is turned off till Input **REG** closed again

Desinfection

Display: **b3**
System in operation **without any safety devices**

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 coductivity 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.

Contents of Chapter G

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).

Warning

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 **E2**: 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 **E3, E4, E5**: 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 **E7**: Cy of permeate to 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 **b0** tank full, although permeate tank empty	Level switch defective
	Display **1-99** system in operation	Pump defective
	Display **b1** 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

Contents of Chapter H

1. Maintenance and monitoring tasks

1.1 Safety information

Caution

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.

Warning

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

Um langfristig einen einwandfreien Betrieb und Funktion der Anlage 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	**Messstelle / Bemerkungen**
Residual hardness in soft water	Check with the hardness kit on the 1V07 tap
Conductivity of feed water	Verification with conductivity measurement device
Temperature of feed water	Verification with conductivity measurement device
Fine filter outlet pressure	Manometer 1Pr02
Operating pressure	Manometer 1Pr05
Permeate output	Durchflussmesser 1FI02
Concentrate output	Durchflussmesser 1FI01
Conductivity of permeate	Display Steuerung
Absence of leaks in the system	

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 desalinization rate drops below 97% or there is a drop in permeate output of about 10%, a concentrate rinse should be performed (see 3.2).

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 task should be performed:

System part	Task to be performed	Maintenance intverval
Fine filter	Replace the fine filter car-tridges and clean the filter housing	-3 months -if the pressure drops by 0.8 bar
Pressure switch	Functional test by blockinng off the feed water inlet → RO must switch off	-6 months
Sensor hardness monitoring device (if any)	Replace sensor	- 12 months - after triggering of sensor
- Conductivity cell(s) - pH-sensor (if existing)	Check of parameters with reference device, if neces-sary new calibration	- on start-up - 1 year - if quality of feed water changes
Filter mat for control cabinet fan (if any)	Check fouling factor and clean as required	- 1 month
	Replace filter mat	- 6 month
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	R+I/ Measuring point	Value	Values when placed in service	Date	Date	Date	Date
Residual hardness of soft water	-	°dH					
Fine filter outlet pressure	1Pro2	bar					
Conductivity of feed water	-	µS/cm					
Temperature of feed water	-	°C					
Operating pressure	1Pro5	bar					
Permeate output	1Flo2	l/h					
Concentrate output	1Flo1	l/h					
Conductivity of permeate	Display control	µS/cm					
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
Fine filter													
Pressure switch													
Sensor hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Filter mat for control cabinet fan (if any)													
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
Fine filter													
Pressure switch													
Sensor hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Filter mat for control cabinet fan (if any)													
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
Fine filter													
Pressure switch													
Sensor hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Filter mat for control cabinet fan (if any)													
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)
Fine filter														
Pressure switch														
Sensor hardness monitoring device														
Conductivity cell pH-sensor (if existing)														
Filter mat for control cabinet fan (if any)														
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!

Contents of chapter I

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.

With 2 pass RO-systems, every stage will be preservated and cleaned seperately.
With 2 pass RO-systems the components of the 2nd stage are designated wit "2" after the aggregate designation. For example the pressure regulating valve of stage 1 is 1V05, the pressure regulating valve of stage 2 is 1V25.

Warning

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 (9B01) 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 valves 9V01 and 9V02 on the preservation tank

☞ Detach the feed water inlet, the permeate pipe and the concentrate pipe of the RO system

☞ The connecting tubes should be connected as follows:
- Connect the outlet from the preservation tank (9V02) with the feed water inlet of the RO system
- 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 (9B01) at a height greater than tha of the system, so as to ensure that the preserving solution will flow into the RO system without any difficulty

☞ Close off the valve (9V02) 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 (9V02) 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 valve (9V02) 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%
	- 500	20	200	3,2
	550 - 1500	50	500	8,0
	1550 - 3500	100	1000	16,0
	3550 - 9500	200	2000	32,0
	9550 -12.000	250	2500	40,0
	12.050 - 17.000	300	3000	48,0
	17.050 – 20.000	400	4000	64,00
	20.050 - 30.000	500	5000	80,00

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 and silica scaling

Generally cleaning should be carried out in the following sequence:
alkali → acid.

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


Warning

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 valve (9V02) 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

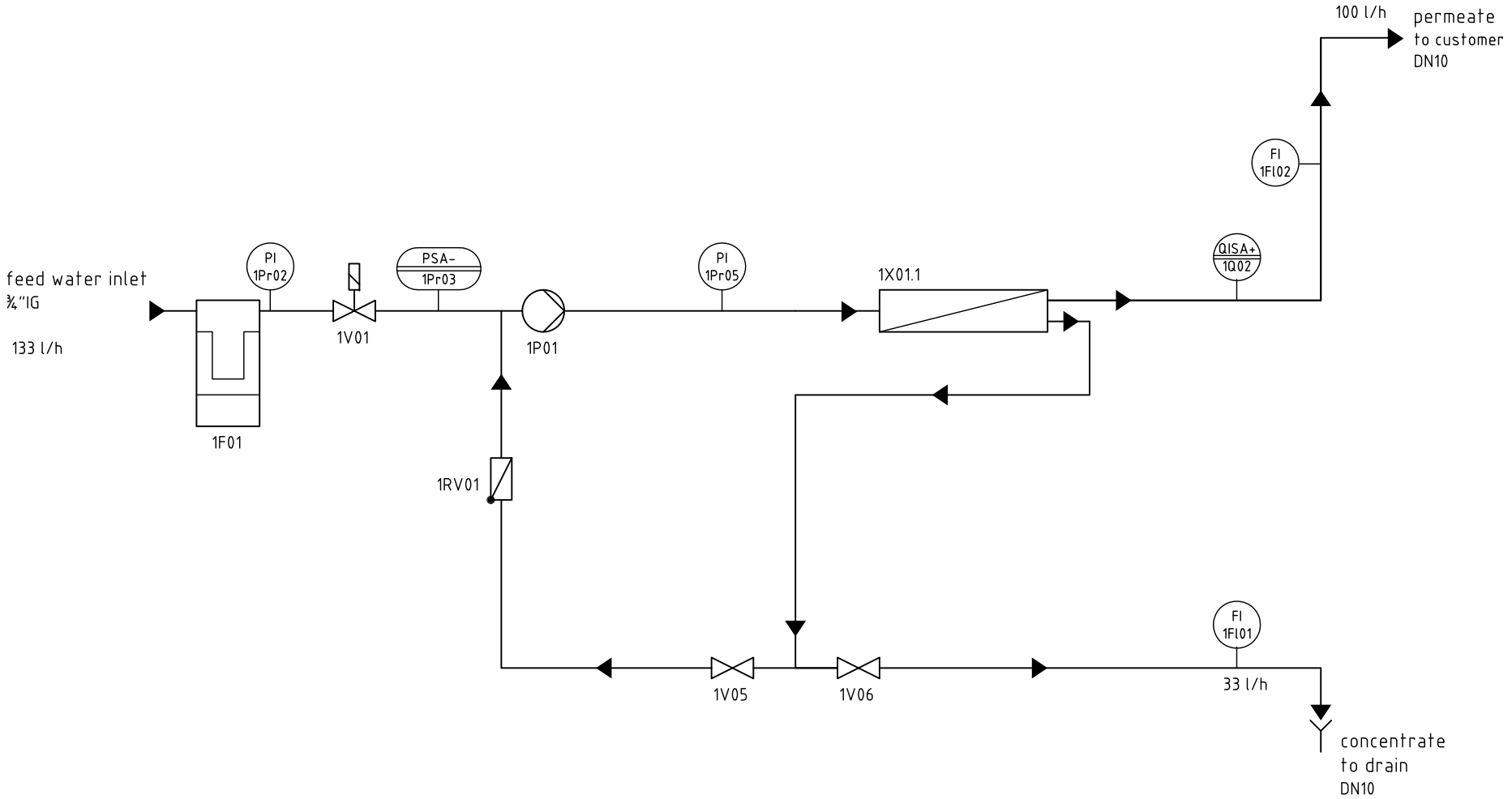
			Cleaning option 1	**Cleaning option 2**
	Permeate output of the system l/h	Soft water supply l	Citric acid powder kg	Hydrochloric acid ml
Art. no.			530 015	530 13
Conc. of chemicals			100%	33%
	- 500	50	1,0	250
	550 - 1500	100	2,0	500
	1550 - 3500	200	4,0	1000
	3550 - 9500	300	6,0	1500
	9550 -12.000	400	8,0	2000
	12.050 - 17.000	500	10,0	2500
	17.050 – 20.000	700	14,0	3500
	20.050 - 30.000	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

			Cleaning option 1		**Cleaning option 2**
	Permeate output of the system l/h	Soft water supply l	NaOH-flakes g	Sodium dodecyl sulphate g	Genesol 703 kg
Art. no.			530 027	530 21	530 051
Conc. of chemicals			100%	90%	-
	- 500	50	50	15	1,25
	550 - 1500	100	100	30	2,50
	1550 - 3500	200	200	60	5,00
	3550 - 9500	300	300	90	7,50
	9550 -12.000	400	400	120	10,00
	12.050 - 17.000	500	500	150	12,50
	17.050 – 20.000	700	700	210	17,50
	20.050 - 30.000	1000	1000	300	25,00

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



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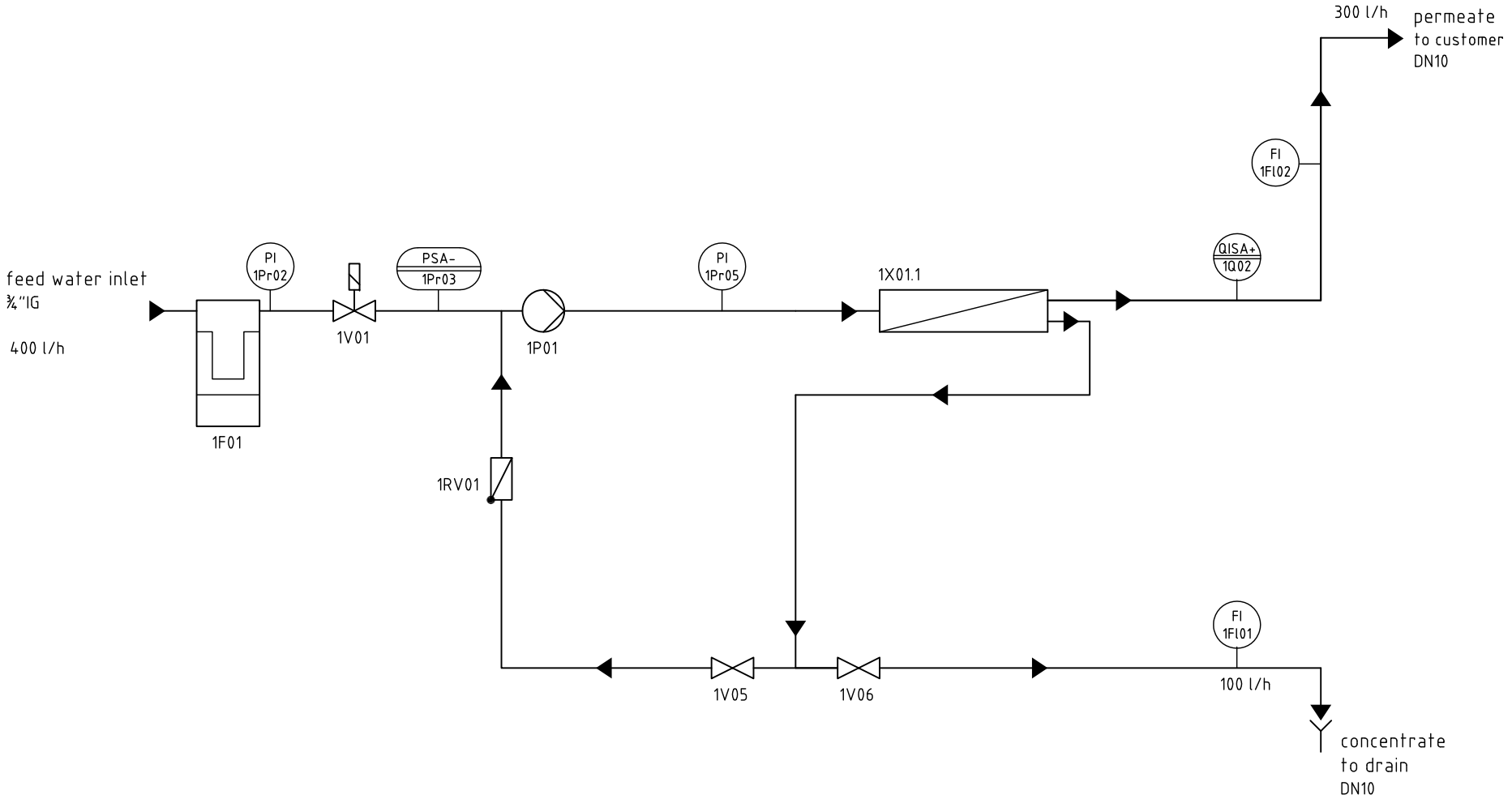
									–		–
									–		–
								Datum	Name		
							Bearb.	29.08.05	Die	UO 100 W/S	
							Gepr.				
							Norm				
										00385281-30005	Blatt
											Bl
Zust.	Änderung		Datum	Name	EDV Nr.	00385281-30005					

UO 100 W/S Code-No.:00385281		**Component list**	
P+I-No	**Code-No.**	**Description**	
1F01	00 330 049 00 335 014	Filter housing 10", 3/4"IG, blue cup Filter cartridge, 10", 5 µm	
1Fl01	00 580 021	Flowmeter concentrate 15-160 l/h	
1Fl02	00 580 026	Flowmeter permeate 40-400 l/h	
1P01	00 390 031	Pump 2507 Ms	
	00 640 002	Motor 0,55 kW	
1Pr02	00 630 006	Pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr03	00 600 062	Pressure switch ⅛" AG	
1Pr05	00 630 209	Pressure gauge operation pressure, Ms, NG63, ¼"h, 0-25 bar	
1Q02	00 100 024	Cy-measuring cell permeat	
1RV01	00 410 027	Check valve Ms ½"	
1V01	00 410 095	Solenoid valve, ½", DN13	
1V05	00 410 039	Regulating valve-concentrate recirculation, ball valve VA ½"	
1V06	00 410 039	Concentrate regulating valve, ball valve VA ½"	
1X01	00 400 003 00 395 142	Vessel, GFK, 2540-1, 40 bar Low pressure element	
	00 382 400	Control with RO 500	



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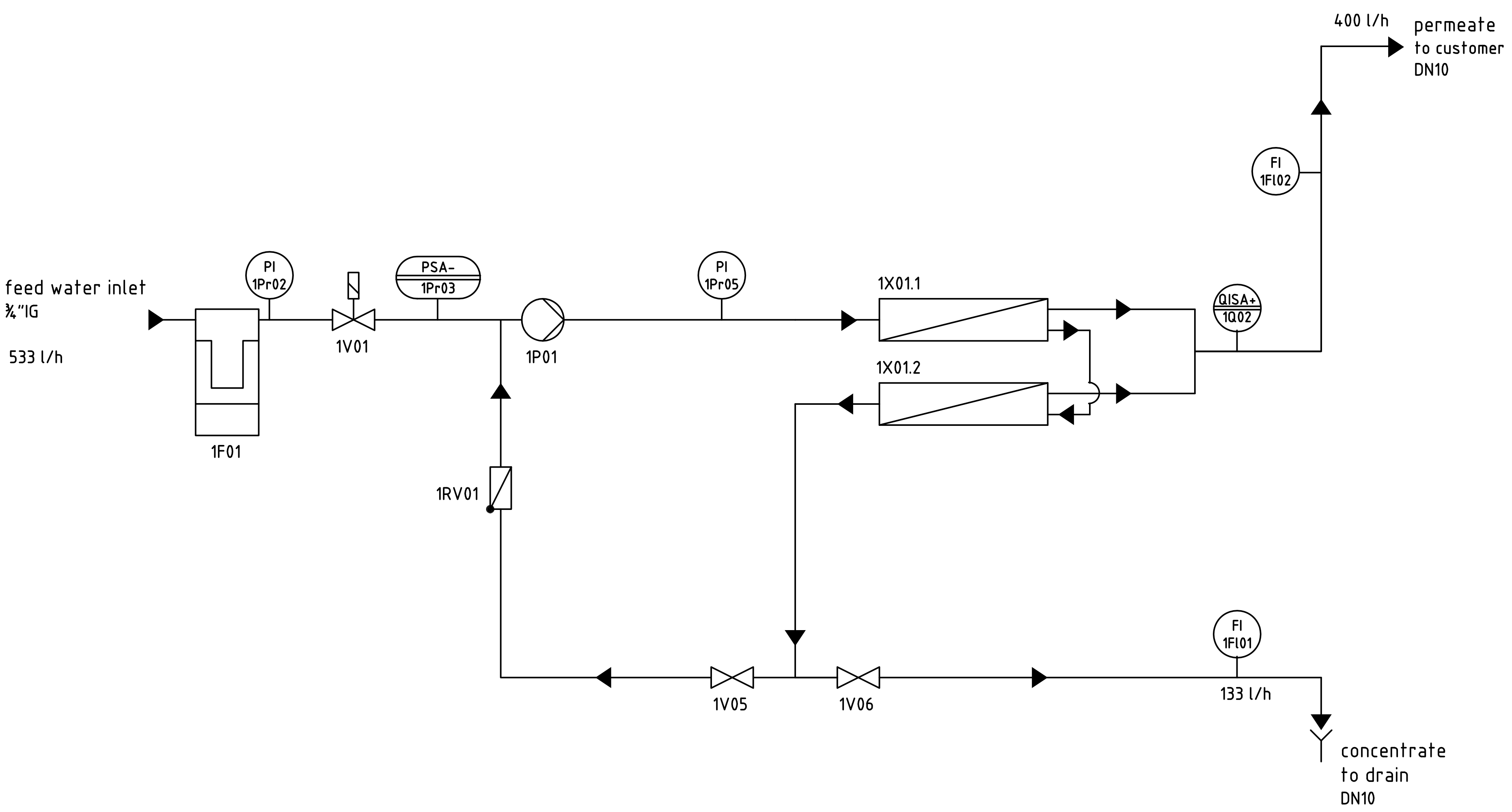
								–	–
								–	–
						Datum	Name		
					Bearb.	29.08.05	Die	UO 300 W/S	
					Gepr.				
					Norm				
								00385283-30004	Blatt
									Bl
Zust.	Änderung	Datum	Name	EDV Nr.	00385283-30004				

UO 300 W/S Code-No.: 00385285		**Component List**	
P+I-No	**Code-No.**	**Description**	
1F01	00 330 049 00 335 014	Filter housing 10", 3/4"IG, blue cup Filter cartridge, 10", 5 µm	
1Fl01	00 580 021	Flowmeter concentrate, 15-160 l/h	
1Fl02	00 580 026	Flowmeter permeate, 40-400 l/h	
1P01	00 390 156	Pump 2539 Ms	
	00 640 011	Motor 0,55 kW	
1Pr02	00 630 006	Pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr03	00 600 062	Pressure switch ⅛" AG	
1Pr05	00 630 209	Pressure gauge operation pressure, Ms, NG63, ¼"h, 0-25 bar	
1Q02	00 100 024	Cy-measuring cell permeat	
1RV01	00 410 027	Check valve Ms ½"	
1V01	00 410 095	Solenoid valve, Ms, ½", DN13	
1V05	00 410 039	Regulating valve-concentrate recirculation, ball valve VA ½"	
1V06	00 410 039	Concentrate regulating valve, ball valve VA ½"	
1X01	00 400 015 00 395 136	Vessel, GFK, 4040-1, 25 bar Low pressure element	
	00 382 400	Control with RO 500	



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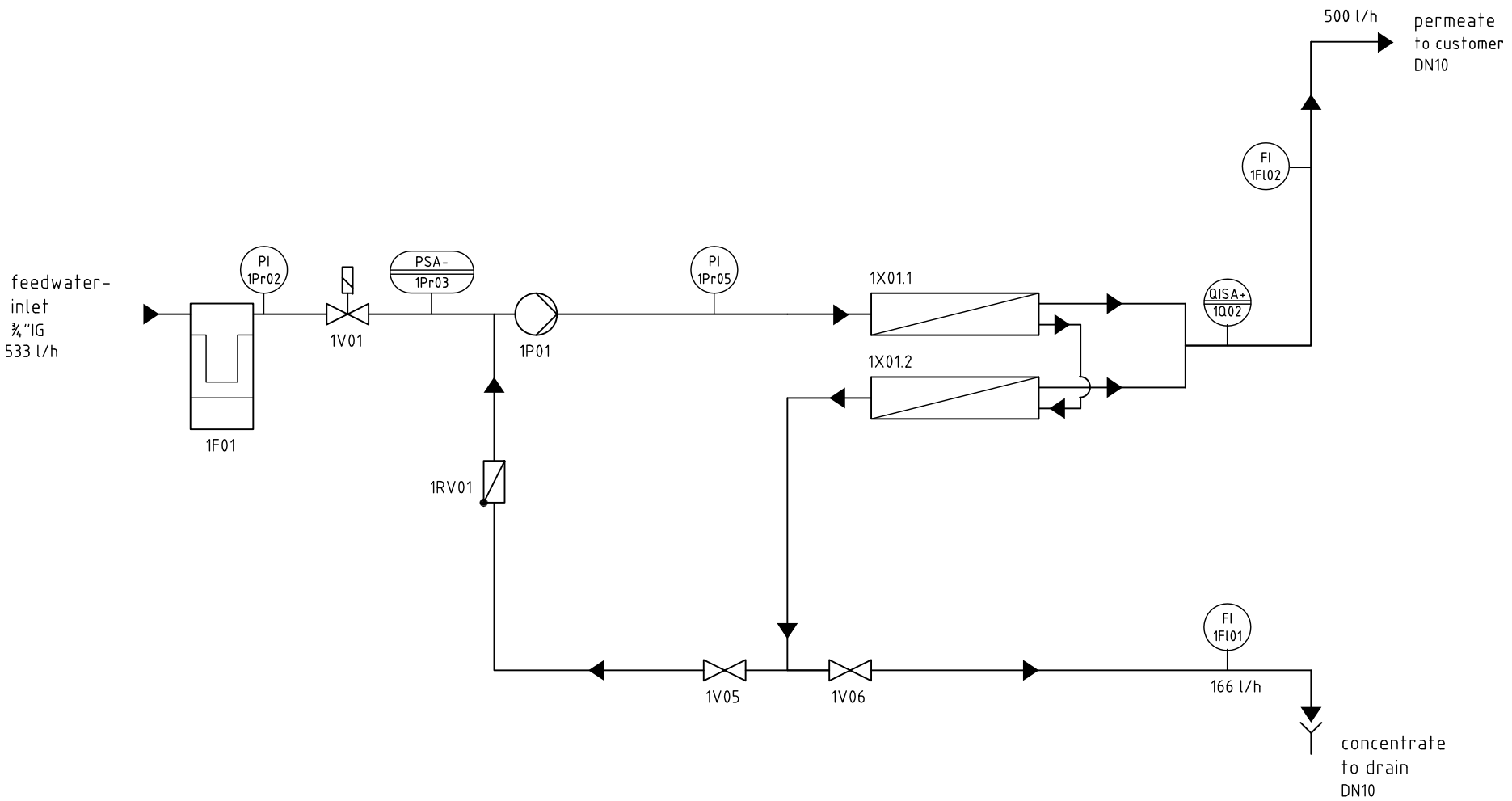
		Datum	Name	UO 400 W/S		
	Bearb.	29.08.05	Die			
	Gepr.					
	Norm					
				00385285-30004		Blatt / Bl
Zust. / Änderung / Datum / Name	EDV Nr.	00385285-30004				

UO 400 W/S Code-No. 00385285		**Component list**	
P+I-No	**Code-No.**	**Description**	
1F01	00 330 049 00 335 014	Filter housing 10", 3/4"IG, blue cup Filter cartridge, 10", 5 µm	
1Fl01	00 580 021	Flowmeter concentrate, 15-160 l/h	
1Fl02	00 580 026	Flowmeter permeate, 40-400 l/h	
1P01	00 390 031	Pump 2507 Ms	
	00 640 002	Motor 0,55 kW	
1Pr02	00 630 006	Pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr03	00 600 062	Pressure switch ⅛" AG	
1Pr05	00 630 209	Pressure gauge operation pressure, Ms, NG63, ¼"h, 0-25 bar	
1Q02	00 100 024	Cy-measuring cell permeat	
1RV01	00 410 027	Check valve Ms 1/2"	
1V01	00 410 095	Solenoid valve, ½", DN13	
1V05	00 410 039	Regulating valve-concentrate recirculation, ball valve VA ½"	
1V06	00 410 039	Concentrate regulating valve, ball valve VA ½"	
1X01	00 400 015 00 395 146	Vessel, GFK, 4040-1, 25 bar Low pressure element 4040 ND	
	00 382 400	Control with RO 500	



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								–	–
								–	–
						Datum	Name		
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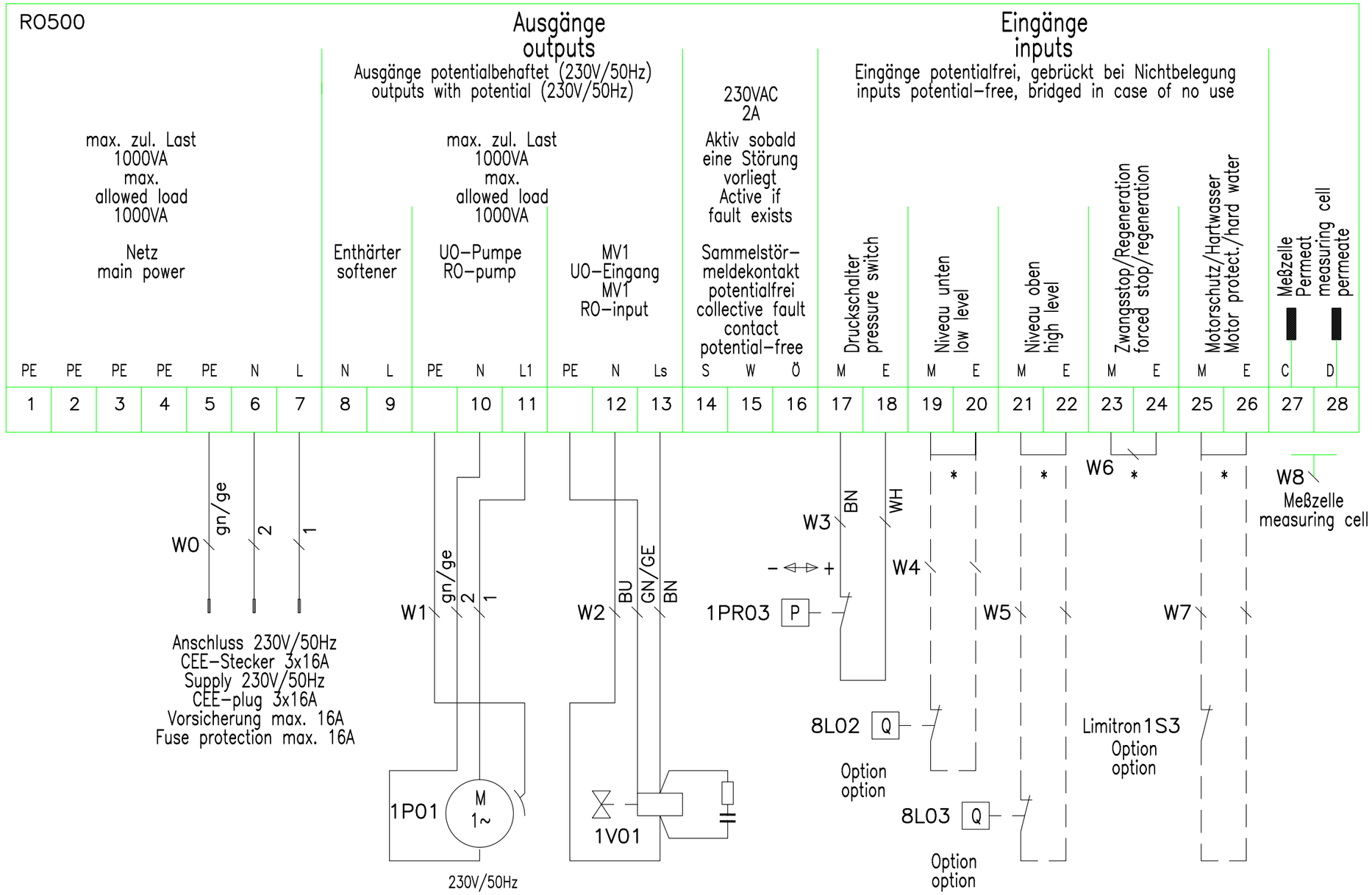
					Gepr.				
					Norm				
								00385574-30000	Blatt Bl
Zust.	Änderung	Datum	Name	EDV Nr.	00385574-30000				

UO 500 W/S Code-No. 00385574		**Component list**	
R+I-Bez.	**Art.Nr.**	**Benennung**	
1F01	00 330 049 00 335 014	Filter housing 10", ¾IG, blaue Tasse Filter cartridge, 10", 5 µm	
1Fl01	00 580 022	Flowmeter concentrate, 20-250 l/h	
1Fl02	00 580 033	Flowmeter permeate, 60-640 l/h	
1P01	00 390 156	Pump 2539 Ms	
	00 640 011	Motor 0,55 kW	
1Pr02	00 630 006	Pressure gauge filter outlet, Ms, NG63, ¼"h, 0-10 bar	
1Pr03	00 600 062	Pressure switch ⅛" AG	
1Pr05	00 630 209	Pressure gauge operation pressure, Ms, NG63, ¼"h, 0-25 bar	
1Q02	00 100 024	Cy-measuring cell permeat	
1RV01	00 410 027	Check valve Ms ½"	
1V01	00 410 095	Solenoid valve, Ms, ½", DN13	
1V05	00 410 039	Regulating valve-concentrate recirculation, ball valve VA, ½"	
1V06	00 410 039	Concentrate regulating valve, ball valve VA, ½"	
1X01	00 400 015 00 395 146	Vessel, GFK, 4040-1, 25 bar Low pressure element 4040 ND	
	00 382 400	Control with RO 500	



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

	Revision	Datum	Name		Datum	Name
a				gez.	23.07.10	Tie
b						
c				gepr.	23.07.10	Ju
d						

Anschlußbelegung RO500
Terminals RO500

Projektbez.: RO 500

Auftragsnr.:

Zeichnungsnr.: 382400-01001

Blatt 1 / 1 Bl.

Operating instructions

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
e

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 V1 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 and the solenoid valve V3 is open, "b0" is displayed and the solenoid valve V1 is closed again after a preset time (**time_displacement**), also the solenoid valve V3 is close afer a preset time (**time_valves_delay**).

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.

If the conductivity measurement is deactivated, there is a lower case o displayed, the limit values will be not monitored.

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 set to "**regeneration**" or "**emergency stop**" by operating (opening) the appropriate switch. The pump is then shut down immediately and the solenoid valve V1 is closed 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 wa**ter" 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 V1 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. The solenoid valve V3 will be opened and the solenoid V1 valve will be closed after two seconds, if applicable. The solenoid valve V3 will be closed after a preset time (**time_valve_delay**).
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 solenoid valve V3 will be open and after a preset time (**time_valve_delay**) the solenoid valve V1 will be open. 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 valves V1 and V3 are switched off after a preset time (**time_valve_delay**) 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.
If the pressure switch signals low pressure to the control unit, the green LED flashes and "**E3**" is displayed and a collective malfunction signal is initiated until the pressure switch again signals the pressure required.

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 µS/cm. When you reach the offset + 20 µS/cm, the offset will be switched to - 20 µS/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
		min.	max.	set by manufacturer
TIME_PRESSURE_AVAILABLE	0.1 sec.	0.1 sec.	9.9 sec.	**9.9 sec.**
TIME_PRESSURE_STARTUP	0.1 sec.	0.1 sec.	9.9 sec.	**9.9 sec.**
TIME_DISPLACEMENT	1.0 sec.	1.0 sec.	250 sec.	**60 sec.**
CONDLIM	0.5 µS/cm	1 µS/cm	99 µS/cm	**50 µS/cm**
CONDWARN	0.5 µS/cm	1 µS/cm	99 µS/cm	**40 µS/cm**
TIME_COND	1.0 min.	1.0 min.	250 min.	**5 min.**
TIME_PRESSURELOW	0.1 sec.	0.1 sec.	9.9 sec.	**1.0 sec.**
TIME_INT_FLUSH_START	1.0 h	1.0 h	250 h.	**24 h**
TIME_ INT_FLUSH _RUN	1.0 min.	1.0 min.	99 min.	**15 min.**

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