Operating Instructions

Reverse-Osmosis-System
Budget RO 80, 130

CE

Translation of the original instructions

Overview of contents

Appendix

Imprint

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

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.

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.

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 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

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 electrical power supply.

Mechanical force

Parts of the system are under excess pressure of up to 25 bar (g). Release the pressure from the system before repairs and maintenance tasks.

Hygiene-critical applications

Danger of contamination of system components due to non sufficient execution of cleaning / disinfection of the unit.

Adhere to the information provided regarding cleaning and disinfection.

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 task

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 member.

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

2.8 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.

2.9 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.

2.10 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

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

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

3.3 Dependencies of permeate output

The permeate output of the system depends on the particular feed water parameters like temperature, feed water pressure and salinity and thus may be lower.
The nominal output specified in the technical data (chapter C) refers to the corresponding design parameters.

Generally, when adjusting the unit, do not exceed max. permeate output and do not underrun min. amount of concentrate.

In addition the following applies to units with permeate output ≥ 600 l/h; do not underrun min. amount of concentrate recirculation.

In addition the following applies to units with permeate output of 120 - 500 l/h; do not exceed max. pump pressure.

Danger

If the system is operated at a higher feed water temperature than the design temperature; do not to exceed the maximum permeate output that is specified in the technical data (chapter C)!

3.4 Conductivity of first permeate

After switching on the RO system, permeate with high conductivity is produced for a short time. Therefore, assure that during the system design of the peripheral systems engineering a minimum running time of the RO system of at least 30 min per shifting process is guaranteed.

Transport and Storage

All units must be secured against slipping and falling over during transport!

The transport weight corresponds to the empty weight. For transport weights, please refer to the Technical Data in Chapter C.

The units can be damaged by frost. Because of this, the units must be protected against frost and freezing during transport and storage.

The min. /max. storage temperature is 0 - 40°C.

The maximum storage duration for the units in their original packing is 12 months at 20 °C.

After this period the membrane module has to be replaced.

The maximum period of storage is 12 months, if the module has been delivered separately in its original packaging.

Contents of Chapter C

1. Technical data

System		Budget RO 80	Budget RO 130
Item-no.:		381 900	381 901
Control		RO 524	
Feed water specification			
Feed water pressure min./max.	bar	3/6 ± 0,5	
Temperature min./max.	°C	5/35	
Connections			
Feed water	DN	20 (¾" AG)	
Permeate / Concentrate	DN	10 (hose nozzle ø13,65 mm)	
Power consumption	kW	0,37	
Power connection	V/Hz	230/50	
Protection type		IP 54	
Output data			
Permeate outlet max.	l/h	80	130
Concentrate outlet (softened water as feed water) approx.	l/h	90	130
Concentrate outlet (hard water as feed water) approx.	l/h	150	230
Operating pressure max.	bar	14	
Prmeate counter pressure max.	bar	0,3, without permeate backflow	
Recovery (softened water as feed water) approx.	%	50	
Recovery (hard water as feed water) approx.	%	35	
Salt rejection rate min.	%	95	
Dimensions and weights			
Dimensions (HxWxD)	mm	370x800x370	
Weight approx.	kg	31	
Environmental data			
Max. ambient temperature	°C	40	
Relative humidity (air)	%	<95, non condensing	
Noise level during operation	dB(A)	74	

Systems are designed for hardness stabilised 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

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 PID in the appendix.

3.3 Functional description

The RO feed water is conveyed to the pump via an activated carbon filter (micron rating 5 µm).

The pump feeds the water with high pressure to the semi-permeable membranes.

The water that passes the membranes (permeate) is almost free from minerals.

The minerals held back are continuously carried away with the concentrate stream.

The installation controller monitors and controls all important functions during permeate production and during idle periods

3.4 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 room in which the system is set up must meet the environmental conditions 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/2) and must be located no more than 2 m away from the system.
- The feed water connection must be provided with a shut-off valve.

1.2 Setting up the system

☞ Unpack the system.

☞ Check over the delivery for completeness and transport damage.
Any deviations or damage must be reported to the manufacturer immediately.

☞ 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

Feed

☞ Connect the inlet.

Permeate

☞ Connect the permeate output with the consumer line.

Concentrate

☞ Connect the effluent line with the drain.

During standstill times of the system the maximum back pressure of 0.3 bar must not be exceeded.

Caution

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

Electrical connection tasks may only be performed by an electrician in accordance with the applicable country-specific regulations.

3.2 Circuit diagram of the system

The circuit diagram of the system is located in the appendix of this operating manual.

3.3 Connecting the power supply

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.

Contents of Chapter E

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 Rinsing the system

The preservative solution contains sodium bisulfite, glycerine and sodium bicarbonate.

The preservation fluid should be drained out into the run-off channel in accordance with applicable regulations governing pouring and draining.

- ☞ Mount the separately delivered membrane element, packed its original packaging, into the installation, before rinsing
- ☞ Connect the product permeate with run-off channel
- ☞ Open feed water
- ☞ Set the system into operation (see Chapter F) **and rinse for minimum 15 minutes**

Before start-up, turn the pump with a screwdriver on the fan side once clockwise.

1.3 Adjusting the recovery

The recovery of the system depends on the pre-treatment of the feed water

	type of orifice	
Feed water	**Budget RO 80**	**Budget RO 130**
Hard water	ø 1,3 mm	ø 1,7 mm
Softened water	ø 1,0 mm	ø 1,2 mm

The installation is fit at the factory with a disc for operation with soft water

Caution

If the installation is fed with hard water while the soft water disc is mounted, the membrane element may be damaged.

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

1.4 Mounting the disc

The disc is mounted in the concentrate outlet pipe as follows:

☞ Unscrew and remove the hose tail from the concentrate outlet

☞ Remove the mounted disc

☞ Mount the new disc as shown in the picture

☞ Re-install the hose tail into the concentrate outlet. Seal it with Teflon tape.

2 Taking the system out of service

After having taken the system out of service >3 months; replace membrane module before re-commissioning.

Contents of Chapter F

1 Operating and display components

	Description	Operatin
A	Main switch	- Turns the system on and off - malfunction acknowledgement[BE]
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 malfuncon Flashing: → malfunction active
E	LED desinfection (red)	Permanent: → desinfection activ

For additional information on the function and operation of the RO 524 control unit, please refer to the RO 524 control unit manual in the appendix of these Operating Instructions.

2 Operating states

Operation

Display: **cy**

Input **NV0** (terminal 24,25) closed

Inlet valve 1V01 opened, pump 1P01 in operation

System is producing permeate

Tank full

Display: **b0**

Input **NV0** (terminal 24,25) 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 26,27) opened

System is turned off till Input **REG** closed again

Desinfection

Display: **b3**

System in operation **without any safety devices**

3 Short description 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)

***(** Only for systems with conductivity measuring, z. B. 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 524 control unit, please refer to the RO 524 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)

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
	1,6 A 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, 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**: Conductivity 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 does not 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
	Pump stops turning	turn the pump with a screwdriver on the fan side once clockwise

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.

Before beginning tasks on the electrical systems and equipment, a check must confirm that power has been disconnected from the system.


Warning

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.

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

2 Maintenance

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

2.1 Maintenance tasks

The following maintenance task should be performed:

System part	Task to be performed	Maintenance interval
- Fine filter	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
- Conductivity cell(s) (if existing)	Check of parameters with reference device, if necessary new calibration	- on start-up - 1year - quality of feed water changes

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													
Conductivity cell (if existing)													

Note: Each maintenance task must be documented with a date and the initials of the person performing the task.

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													
Conductivity cell (if existing)													

Note: Each maintenance task must be documented with a date and the initials of the person performing the task.

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													
Conductivity cell (if existing)													

Note: Each maintenance task must be documented with a date and the initials of the person performing the task.

Maintenance log

Customer: _____

_____

_____

System type: _____

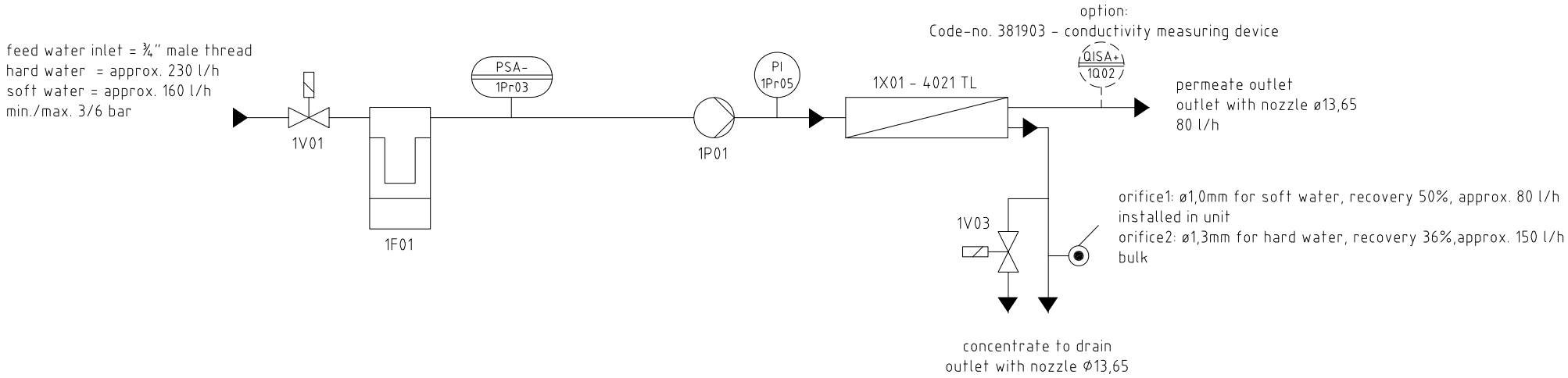
Item No.: _____

Placed in service on: _____ CW _____

4. Quarter / year: _____

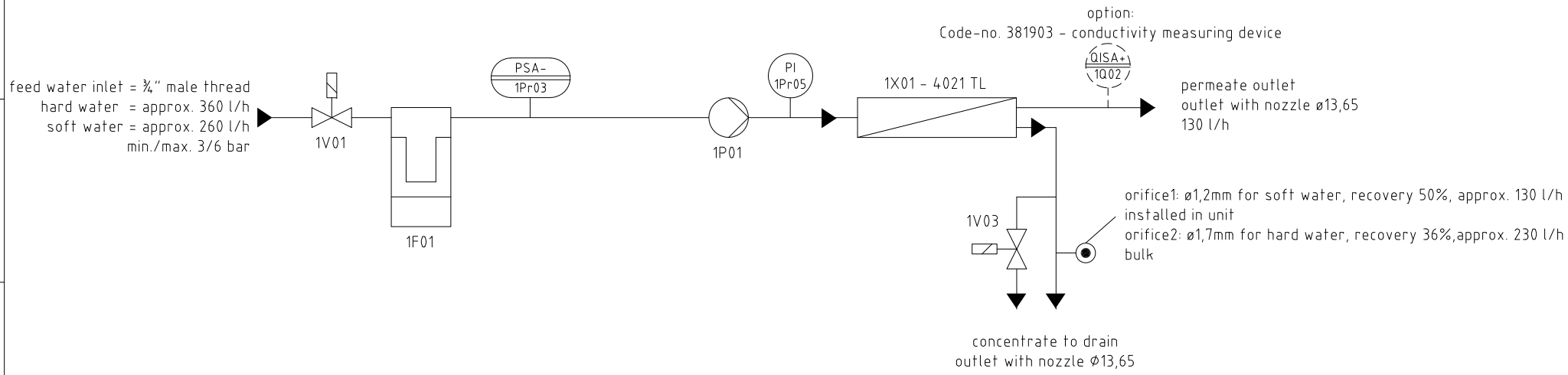
System part	CW 40	CW 41	CW 42	CW 43	CW 44	CW 45	CW 46	CW 47	CW 48	CW 49	CW 50	CW 51	CW 52 (CW 53)
Fine filter													
Pressure switch													
Conductivity cell (if existing)													

Note: Each maintenance task must be documented with a date and the initials of the person performing the task.



							Oberfläche	Maßstab	Position – Menge –
								-	-
								-	-
						Datum	Name	Budget RO 80 l/h	
					Bearb.	15.05.07	Dieterich		
					Gepr.				
					Norm				
								00381900-30000	Blatt
									Bl
Zust.	Änderung		Datum	Name	EDV Nr.	00381900-30000			

Budget RO 80 l/h Item-No. 00 381 900		**Component list**	
PID-No.	**Item-No.**	**Description**	
1F01	00 330 049 00 335 082	filter housing 10", ¾"IG, activated carbon - filter cartridge 10"	
1P01	00 390 473	pump PSAM 70/A, 230V/50Hz, 0,37kW	
1Pr03	00 600 062	pressure switch NO, 1bar, 1/8"	
1Pr05	00 630 209	pressure gauge filter outlet, SS, NG63, 1/4"h, 0-25 bar	
1V01	00 410 214	solenoid valve, ½", 0,3-10bar, 24V/DC	
1V03	00 410 214	solenoid valve, ½", 0,3-10bar, 24V/DC	
1X01	00 400 164 00 395 235	pressure vessel, 4021-1 membrane module, 4021	
	00 545 282	control RO 524, 24V/DC	
1Q02	00 381 903	permeate conductivity measurement RO Budget	



							Oberfläche	Maßstab	Position – Menge –
								-	-
								-	-
						Datum	Name	Budget RO 130 l/h	
					Bearb.	17.08..07	Dieterich		
					Gepr.				
					Norm				
								00381901-30000	Blatt
									Bl
Zust.	Änderung	Datum	Name	EDV Nr.	00381901-30000				

Budget RO 130 l/h Item-No. 00 381 901		**Component list**	
PID-No.	**Item-No.**	**Description**	
1F01	00 330 049 00 335 082	filter housing 10", ¾"IG, activated carbon filter cartridge 10"	
1P01	00 390 473	pump PSAM 70/A, 230V/50Hz, 0,37kW	
1Pr03	00 600 062	pressure switch NO, 1bar, 1/8"	
1Pr05	00 630 209	pressure gauge filter outlet, SS, NG63, 1/4"h, 0-25 bar	
1V01	00 410 214	solenoid valve, ½", 0,3-10bar, 24V/DC	
1V03	00 410 214	solenoid valve, ½", 0,3-10bar, 24V/DC	
1X01	00 400 164 00 395 145	pressure vessel, SS, 4021-1 membrane module, 4021	
	00 545 282	control RO 524, 24V/DC	
1Q02	00 381 903	permeate conductivity measurement RO Budget	

Print date: 07.07.2014

1 2 3 4 5 6 7 8

U11

Ausgänge outputs
230VAC max. 6A
230VAC max. 6A

Ausgänge outputs
250VAC/24VDC 6A
24VDC 0,5A

Aktiv sobald eine Störung vorliegt
Active if fault exists

Eingänge inputs
Eingänge potentialfrei, gebrückt bei Nichtbelegung
inputs potential-free, bridged in case of no use

L	N	N	L	N	L1	PE	PE	PE	PE	PE	PE	W	S	Ö	M	Ls	M	Ls	M	E	M	E	M	E	M	E	M	E	C	D
Netz main power		Enthärter softener		UO-Pumpe RO-pump		Netz main power						Sammelstör-meldekontakt potentialfrei collective fault contact potential-free			MV1 UO-Eingang MV1 RO-input		MV3 Konzentrat MV3 concen-trate		Druckschalter pressure switch		Niveau unten low level		Niveau oben high level		Zwangsstop/Regeneration forced stop/regeneration		Motorschutz/Hartwasser Motor protect./hard water		Meßzelle Permeat measuring cell permeate	
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	29	30	31

Rahmen frame

Schuko Stecker plug
230V/50Hz
Vorsicherung max. 10A
Fuse protection max. 10A

M1 M 1~
230V/50Hz
P1

Y1

Y2

P
S1

LS?1 Q
Option option

LS?1 Q
Option option

Limitron S2
Option option

Meßzelle measuring cell

Option option

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

	Revision	Datum	Name		Datum	Name
a				gez.	25.0.08	Tie
b						
c				gepr.		
d						

Projektbez.
Control RO 524 for Budget RO

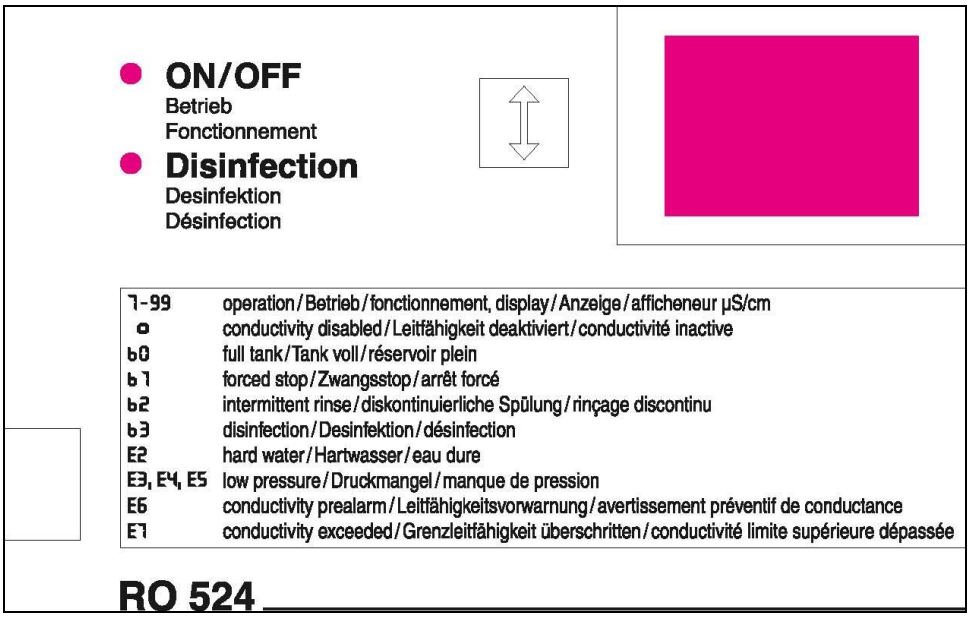
Auftragsnr.

Zeichnungsnr.
545338-01000

Blatt 1
1 Bl.

Operating instructions

RO 524 control system



Last update	Date	Author	Remarks / Software Version
1	04.04.14	Mü	Additional: *MV1(1V01) **MV3(1V03)
2	12.08.15	Mü	Update, page 3 – 1.1 chapter

CE

Translation of original instructions

Table of Content

1 Description of functions

1.1 Normal operation

Following **"power-on"**, the control system starts an initialization cycle with a duration of 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 the level in the tank makes it necessary to fill it, i.e. both level switches are closed, the solenoid valve *MV1 will open.

(The unit may also be equipped with one level switch only; in this case, a jumper must be installed on the low level switch.)

The water pressure is then checked by the pressure switch.

If the pressure signal is not available, an automatic shut down is initiated after a preset time and **"E5"** is displayed.

If the pressure signal is received, the pump is started up after a preset time and the water conductivity measured is indicated.

This operating status is changed if the upper level switch closes, indicating that the tank is full.

In this case, the pump is switched off and the concentrate valve **MV3 is opened; **"b0"** is displayed.

The inlet solenoid valve *MV1 is closed again after a displacement time and the concentrate valve **MV3 is also closed after a preset time.

If the pressure switch signals low pressure to the control unit while the pump is running, the green LED flashes and **"E3"** is displayed until the pressure switch signals the pressure again. After a preset time, the pump is restarted.

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

The installation starts up again automatically after 1 minute. If the alarm occurs again, the delay is doubled until the 32 minute maximum is reached. The restart delay remains 32 minutes until the installation is switched off at the mains switch.

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

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

If the alarm limit is exceeded, the unit is automatically shut down and **"E7"** is displayed.

If the conductivity measurement is disabled, the control system displays a run indicator (lowercase *o*) instead of the conductivity on the right side of the 7-segment display and the conductivity limit warning values will be not monitored anymore.

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

1.2 Regeneration (forced stop)

The unit can be set to "**regeneration**" or "**forced stop**" by operating (opening) the appropriate inlet.

The pump is then shut down immediately and the inlet solenoid valve *MV1 is closed.

If the inlet is closed, the control unit is switched back to normal operation.

This is the case when an individual water softening unit is installed upstream of the unit.

1.3 Hard water (Limitron)

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

1.4 Disinfection (to be carried out by technically qualified staff only)

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 inlet solenoid valve *MV1 is switched on, a centralised alarm is initiated and the red LED starts flashing slowly.

If meanwhile the button has been released, 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 concentrate valve **MV3 will be opened.

Then, the inlet solenoid valve *MV1 will be closed and, if applicable, the concentrate valve.

Caution:

> In this mode of operation, all safety functions are deactivated. Operation only permitted under close supervision.
>
> Make sure that the water pressure is correct in order to prevent damage to the pump

1.5 Intermittent flushing

If the inlet solenoid valve *MV1 is switched off for a preset time in normal operation, in other words if the tank is still full, the control system will switch to "intermittent flushing".

"**b2**" is displayed, the concentrate valve **MV3 will be opened first and then the inlet solenoid valve *MV1 will be opened.

The valves are switched off in reverse order and with the same time intervals. The control system switches back to normal operation.

If the pressure switch signals low pressure to the control unit, the green LED flashes and a centralised alarm is initiated.

"**E3**" is displayed until the pressure switch signals the pressure again.
Calibration (to be carried out by technically qualified staff only)
To switch to the "calibration" mode, press the push button before switching the power on and keep the button pressed during initialization while "**88**" and then "**b3**" are displayed.

The conductivity value is displayed alternately with "**C**". A centralised alarm is initiated and the red LED starts flashing slowly. The green LED is lit and the pump is switched on.

Each time you press the button, the conductivity offset value is increased by approx. 2%.

Each time you press the button, the current conductivity value is displayed immediately and the current offset is stored irrespective of whether mains power is available.

When you reach the maximum offset, the conductivity measurement will be switched off and "OF" will be displayed.

The offset will be switched to minimum value the next time the push button is pressed until, after having pressed the button 62 times, the initial value is displayed again.

Calibration mode can only be terminated by switching the power off.

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

1.6 Emergency shut-down

Emergency shut-down means that the pump is shut down immediately and the concentrate valve **MV3 is opened.

The corresponding malfunction signal "**E**" is displayed, the green LED flashes rapidly and a centralised alarm is initiated.

First the solenoid valve V1 will be closed and then, if applicable, the concentrate valve **MV3.

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

2 Operating parameters

The following table lists the factory setting, precision and limit of the operating parameters.

Note:
Operating parameters can only be programmed by the manufacturer!

Parameter	Precision	Limits		Setting
		min.	max.	set by manufacturer
TIME_PRESSURE_AVAILABLE	0.05 sec.	0.1 sec.	9.9 sec.	**9.9 sec.**
TIME_PRESSURE_STARTUP	0.05 sec.	0.1 sec.	9.9 sec.	**9.9 sec.**
TIME_DISPLACEMENT	1.0 min.	0 min.	99 min.	**3 min.**
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	0.05 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_VALVE_DELAY	0.05 sec.	0 sec.	60 sec.	**10 sec.**
COND_OFFSET	0.5	-30	+30	**-20**

Parameters which are set to 0 are disabled.

Description of parameters

TIME_PRESSURE_AVAILABLE — Time from switching on the inlet solenoid 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 (switching on of concentrate valve **MV3) to switching off the inlet solenoid valve *MV1.

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

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

TIME_COND — Time between exceedance of the 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 inlet solenoid valve off (tank full).

TIME_VALVE_DELAY — Time to avoid simultaneous valve activation.

COND_OFFSET — Offset for conductivity measuring cell calibration.

3 Status and malfunction signals

Signal	Explanation
88	Signal during initialization**.**
b0	Signal in normal operation; **"tank full"** if the pump is not switched on (normally when the tank is full)
b1	**"Emergency stop/regeneration"** mode
b2	**"Intermittent flushing"** mode displayed alternately with the conductivity value when the pump is running
b3	**"Disinfection"** mode displayed alternately with the conductivity value when the pump is running
C	**"Calibration"** mode displayed alternately with the conductivity value
OF	Displayed in **"calibration"** mode if conductivity measurement is to be switched off
□	Displayed in all operating modes except **"calibration"** if the conductivity measurement is disabled
E2	**"Hard water"** or Limitron emergency shut down, displayed if the corresponding switch is opened
E3	Malfunction signal if no pressure is measured for a certain time with the pump running (**"low pressure"**)
E5	**"Low pressure"** signal shown if no pressure is measured for a preset time after switching on the inlet solenoid valve *MV1
E6	**"Conductivity warning"** signal shown if the conductivity warning limit is exceeded for more than 5 minutes; displayed alternately with other operating signals
E7	**"Conductivity alarm"** signal shown if the conductivity alarm limit is exceeded for more than 5 minutes; displayed alternately with other operating signals

4 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	29	30	31
L	N	N	L	N	L1	PE	PE	PE	PE	PE	PE	W	S	Ö																
Mains 230V		Soft. 230V		Pump 230V									STO		Valve *MV1 24VDC		Valve **MV3 24VDC		PS		LLEV		HLEV		REG		MOT		Cond. Sensor	

x 1	L	230V AC power supply, phase conductor 1
x 2	N	230V AC power supply, neutral
x 3	N	230V AC power supply for softener, neutral
x 4	L	230V AC power supply, phase conductor 1 max 5A
x 5	N	pump motor P1, neutral
x 6	L1	pump motor P1, normally open contact max. 3.8A
x 7	PE	230V AC power supply, earth
x 8	PE	earth
x 9	PE	earth
x 10	PE	earth
x 11	PE	earth
x 12	PE	earth
x 13	STO C	centralised alarm contact (central control), 250V AC, 6A, changeover contact – floating
x 14	STO NO	centralised alarm contact (central control), 250V AC, 6A, normally open – floating
x 15	STO NC	centralised alarm contact (central control), 250V AC, 6A, normally closed, floating
x 16	*MV1 earth	solenoid valve *MV1, earth
x 17	*MV1	solenoid valve *MV1 normally open contact, 24VDC, 0.5A
x 18	**MV3 earth	solenoid valve **MV3, earth
x 19	**MV3	solenoid valve **MV3 normally open contact, 24VDC, 0.5A
x 20	PS earth	pressure switch – earth
x 21	PS	pressure switch input 24V DC, 10mA
x 22	LLEV earth	low level switch – earth
x 23	LLEV	low level switch input 24V DC, 10mA
x 24	HLEV earth	high level switch – earth
x 25	HLEV	high level switch input 24V DC, 10mA
x 26	REG earth	regeneration (emergency stop) – earth
x 27	REG	regeneration (emergency stop) - input 24V DC, 10mA
x 28	MOT earth	motor circuit breaker (hard water, Limitron)- input
x 29	MOT	motor circuit breaker (hard water, Limitron)- input 24V DC, 10mA
x 30	COND sensor	conductivity sensor input
x 31	COND sensor earth	conductivity sensor – earth