Operating Instructions

Reverse-Osmosis-System

UO-D 600/ 900/ 1200/ 1500/ 2000

UO-D 2000

CE

Translation of the original instructions

Overview of Contents

General Information	A
Transport and Storage	B
Technical data / Product description	C
Set-up and Assembly	D
Placing the system in service / Taking it out of service	E
Operation / Monitoring	F
Malfunctions	G
Maintenance	H
Preserving / Cleaning the system	I

Appendix

PID flowcharts / spare parts lists	I
Circuit diagram	II
Control system manual RO Digital v1.8.x	III

Imprint

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Contents of Chapter A

1 Notes on using the Operating Instructions 2

2 General safety information 3

2.1 Explanation of symbols and references 3

2.2 Additional safety requirements 3

2.3 Usage in accordance with intended purpose 3

2.4 Improper use 3

2.5 Operating staff 3

2.6 Residual dangers 4

2.7 Bringing the system to a stop in the event of an emergency 4

2.8 Safety information for maintenance task 5

2.9 Disposing of system parts and operating materials 5

2.10 Unauthorized conversion and manufacturing replacement parts 5

2.11 Warrantee claims and liability 5

3 Basic principles of reverse osmosis systems 6

3.1 The principle of reverse osmosis 6

3.2 Calculation equations 6

3.3 Dependencies of permeate output 7

3.4 Conductivity of first permeate 7

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
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 or hardness stabilized 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 Improper use

The reverse osmosis unit is not intended for the production of water for human consumption. The permeate produced must not be fed into the drinking water supply. Operational safety of this installation can only be guaranteed if the installation is used in accordance with the purpose defined in the technical manual. Any purpose or operation beyond the mentioned limits is considered as incorrect. The manufacturer/ supplier assumes no liability for damages resulting from incorrect use; this risk is carried solely by the plant operator.

2.5 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.

2.6 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.

2.7 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

2.8 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

2.9 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.

2.10 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.

2.11 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

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

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

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

Units have to be transported in upright position and in its original packaging.

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.

Prior delivery, units are filled with preserving- and antifreeze mixture. Antifreeze agent is effective down to -10° Celsius. The unit can be damaged by frost. Because of this, the unit 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 that, the preservative fluid must be rinsed out and replaced if necessary.

Contents of Chapter C

1 Rating plate 2
1.1 Rating plate specifications 2
1.2 Identification of the system 3
2 Available Options 3
2.1 Description of the Options 4
3 Technical data 5
4 Usage limits 7
5 Product description 8
5.1 Working principle diagram 8
5.2 Functional description 8

1 Rating plate

The rating plate is located on the front side of the system. It contains information on the current system and the particular installed options.
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.

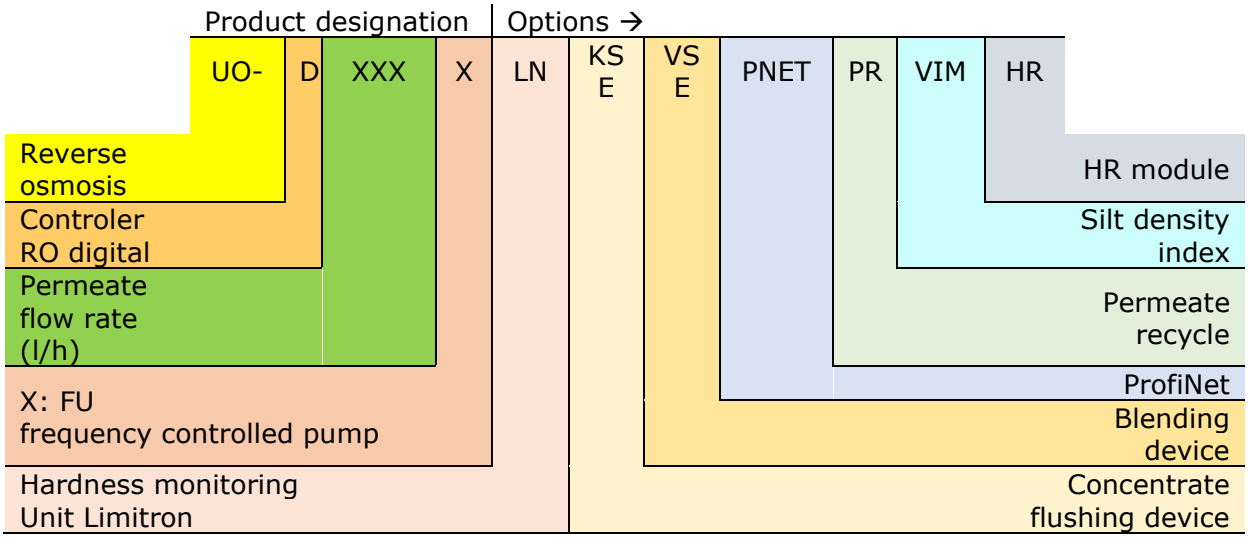
1.1 Rating plate specifications

Specifications and pictograms on the rating plate of the system:

	Pictogram and/ or Specification
☞ CE-marking	
☞ Type designation	UO-D ...
☞ Item no.:	387 xxx
☞ Serial number	AF YY-xxxxxx (AF year-consecutive number)
☞ Year of manufacture	(year)
☞ Electrical connection	(V/Hz)
☞ Power input	(kW)
☞ Pre-Fuse	(A)
☞ Protection type	(IP)
☞ Application class	
☞ Consult operating manual!	
☞ Indoor installation	

1.2 Identification of the system

The type designation on the rating plate consists of the product designation and the installed options. Use the following matrix to get an explanation for the type designation of the particular existing unit.



2 Available Options

The available options for this system are shown in the PID and the spare parts list; both are located in the appendix of this manual. The following table shows the available options including their item-numbers for the particular system type.

option	LN	KSE	VSE	PNET	PR	VIM	HR
Item – no.:	1)	383774	383776	541842	383775	382284	383777
UO-D xxx	x	x	x	x	x	x	x
UO-D xxx FU	x	x	x	x	x	x	x

1) 370038 UO-D 600 – 1500 (FU),
370069 UO-D 2000 (FU)

2.1 Description of the Options

Hardness monitoring unit LN

Device for continuously monitoring the feed water hardness. The hardness monitoring unit has a floating contact for the signal exchange. In case of a detected hardness breakthrough, the RO-unit will be shut-down.

Concentrate flushing unit KSE

Time controlled draining of the concentrate during shut-down by an automatic bypass valve with the pressure of the RO feed water.

Blending device VSE

Automatic bypass of the RO System to blend permate with feedwater in the outlet tank, to adjust the specific conductivity after the RO system. The maximum output corresponds to the permeate flow rate of the unit.

Profinet connection PNET

Standardized possibility to transfer all measured and logged data to customer-side PLC e.g. central control system.

Permeate recycle PR

The first permeate at unit's start-up is recirculated to pump 1P01 until the adjusted permeate minimum quality is reached. The permeate valve 1V02 will be switched to "recirculation"" or "production" depending on the conductivity measured at 1Q02.

Connection for Silt density index monitoring VIM

Measurement of the Silt Density Index SDI. The SDI is a cumulative parameter. It estimates the fouling intensity of a RO module.

HR-Module

Membrane-modules with higher retention rate (typically >98.5%) for higher permeate quality.

Depending on the particular feed water parameters like temperature, feed water pressure and salinity, there will a decrease in permeate output accordingly, when using HR modules.

3 Technical data

System		UO-D 600	UO-D 900	UO-D 1200	UO-D 1500	UO-D 2000
Item-no.:		387151	387152	387153	387154	387155
Control		RO digital				
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	20				32
Permeate	DN	20				20
Concentrate	DN	15				15
Power consumption	kW	1.5		2.2		3.0
Power connection	V/Hz	3x400/50				
Protection type		IP44				
Output data						
Permeate outlet max. *	l/h	600	900	1200	1500	2000
Concentrate at 75% yield	l/h	200	300	400	500	700
Concentrate recirculation min.	l/h	1000	800	600	500	1000
yield, depending on feed water quality	%	75-80				
Salt rejection rate min.	%	97				
Salt rejection rate min. with option HR	%	>98.5				
Dimensions and weights						
Dimensions (WxDxH)	mm	610x810x1800				
Weight approx.	kg	140	160	180	200	220
Environmental data						
Ambient temperature min./max.	°C	5/40				
Relative humidity	%	<95, non condensing				
Sound level max.	dB(A)	75				

***(see sec. A 3.3) **Systems are designed for softened drinking water without chlorine in accordance with the German Drinking Water Ordinance with a salt content of 1000 mg/l and at a feed water temperature of 15 °C. Max. permeate counter pressure 0.3 bar!**

System		UO-D 600 FU	UO-D 900 FU	UO-D 1200 FU	UO-D 1500 FU	UO-D 2000 FU
Item-no.:		387161	387162	387163	387164	387165
Control		RO digital				
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	20				32
Permeat	DN	20				20
Concentrate	DN	15				15
Power consumption	kW	2.2				4.0
Power connection	V/Hz	3x400/50-60				
Protection type		IP44				
Output data						
Permeate outlet max*	l/h	600	900	1200	1500	2000
Concentrate at 75% yield	l/h	200	300	400	500	700
Concentrate recirculation min.	l/h	1000	800	600	500	1000
yield, depending on feed water quality	%	75-80				
Salt rejection rate min.	%	97				
Salt rejection rate min with option HR	%	>98.5				
Dimensions and weights						
Dimensions (WxDxH)	mm	610x810x1800				
Weight approx.	kg	140	140	140	140	140
Environmental data						
Ambient temperature min./max.	°C	5/40				
Relative humidity	%	<95, non-condensing				
Sound level max.	dB(A)	75				

***(see sec. A 3.3) **Systems are designed for softened drinking water without chlorine in accordance with the German Drinking Water Ordinance with a salt content of 1000 mg/l and at a feed water temperature of 15 °C. Max. permeate counter pressure 0,3 bar!**

4 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.) They also must be operated 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)

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.

5 Product description

5.1 Working principle diagram

See the PID in the appendix.

5.2 Functional description

RO-unit feed water passes through the hardness monitoring device 1X02 (optional) and the fine filter 1F01 (filter mesh size 5µm) and reaches then pump 1P01.
The pump unit 1P01 pumps the water through the semipermeable membranes 1X01.x.at high pressure. Because 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 **permeate**.
The salts that are held back are continually rejected into the wastewater channel with the **RO concentrate**. The control unit of the system monitors and controls all important functions during permeate production and downtime.

Contents of Chapter D

1 Set-up 2
1.1 Requirements for the set-up location 2
1.2 Setting up the system 2
2 Water-side connections 3
2.1 Necessary qualifications of the assembly staff 3
2.2 Making the hydraulic connections 3
3 Electrical connection 4
3.1 Necessary qualifications of the assembly staff 4
3.2 Circuit diagram of the system 4
3.3 Connecting the power supply 4
3.4 Connecting the accessories / signal exchange 4

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. In addition, there should be 1.0 m in front of the system and 0.8 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.

- 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) 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.

- There must be control air connection.

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.

☞ 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 3

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

Feedwater

☞ Remove the sealing disks from the screw connection in the inlet.
(sealing disks are not present in systems with flange connections)

☞ Connect the inlet

Permeate

☞ Remove the sealing disks from the screw connection in the permeate outlet.
(sealing disks are not present in systems with flange connections)

☞ Connect the permeate outlet with the consumer line

Concentrate

☞ Remove the sealing disk from the concentrate outlet.
(sealing disks are not present in systems with flange connections)

☞ lay the concentrate outlet to the wastewater drain

Prevent recontamination!
Do not connect the concentrate outlet piping with the wastewater drain directly.

Caution

During standstill times of the system the maximum back pressure of 0.3 bar must not be exceeded. The cross section of permeate piping by customer may only be one nominal width greater than the permeate output piping of the system. At a back pressure > 0.3 bar and the risk 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.

☞ When using three-phase alternating current, ensure that the direction of the rotating field and the direction of rotation of the pump are of right-hand rotation.

3.4 Connecting the accessories / signal exchange

Connections for the

– Product container level

– Forced stop

– Combined malfunction

should be made according to the circuit diagram.

Active analogue output at the unit´s controller; do not connect power (24 V DC) on the 4-20 mA analogue outputs.

Contents of Chapter E

1 Placing the system in service 2

1.1 Qualifications of the commissioning staff 2

1.2 Rinsing out the preservative fluid 2

1.3 Adjusting the operating parameters 3

1.3.1 Installations without pump regulating valve 1V04 3

1.3.2 Installations with pump regulating valve 1V04 3

1.4 Adjustments on blending device VSE 4

2 Taking the system out of service 4

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 out the preservative fluid

The preservative solution contains 1.5% sodium bisulfite, 20% glycerine and 2.5% sodium bicarbonate. 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 outlet with run-off channel
- ☞ Open valves 1V04 (if existing), 1V05 and 1V06 completely
- ☞ Open feed water
- ☞ Switch main-switch On
- ☞ Set the system into operation (see Chapter F) **and rinse for minimum 45 minutes**

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

1.3 Adjusting the operating parameters

1.3.1 Installations without pump regulating valve 1V04

☞ Adjust concentrate flow (see chapter C) on 1Fl01 with valve 1V06

☞ Adjust permeate flow (see Chapter C) on 1Fl02 with valve 1V05

☞ If necessary adjust concentrate recirculation (see Chapter C) with valve 1V06

1.3.2 Installations with pump regulating valve 1V04

☞ Adjust valve 1V04 to middle position (50% open)

☞ Adjust concentrate flow on 1Fl01 (see chapter C) with valve 1V06

☞ Adjust concentrate recirculation on 1Fl03 (if existing - see Chapter C) with valve 1V05

☞ Adjust permeate flow on 1Fl02 (see Chapter C) with valve 1V04

☞ If necessary readjust concentrate recirculation (if existing) with 1V05 and concentrate flow with 1V06

☞ Record the operating data of the system on a log sheet (see Chapter H)

☞ Turn off the system

☞ Reconnect the permeate with the tank or consumer

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.

The permeate output of the system depends on the particular feed water parameters like temperature, feed water pressure and salinity. For further information, see Chapter A/3.3.

1.4 Adjustments on blending device VSE

Adjustment of the amount of blending water for option VSE:

☞ with the start of pump 1P01 solenoid valve 1V14 opens

☞ adjust the amount of blending water on 1Fl14 with valve 1V15

The amount of soft water intended for blending must not exceed the max. permeate output of the unit.

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 2

1.1 Operating and display components RO digital 2

2 Operating states 3

2.1 Off 3

2.2 Operating 3

2.2.1 Start 3

2.2.2 Production 3

2.2.3 Concentrate rinsing 3

2.2.4 Standby 4

2.2.5 Discontinous rinsing 4

2.3 Disinfection 4

2.4 Rinsing 4

3 Brief description of the RO digital control system 5

3.1 Menu structure 5

3.2 Access Authorisation 6

3.3 Display level (rotating display) 7

3.3.1 Display level in plain text depiction 9

3.4 User-Level 10

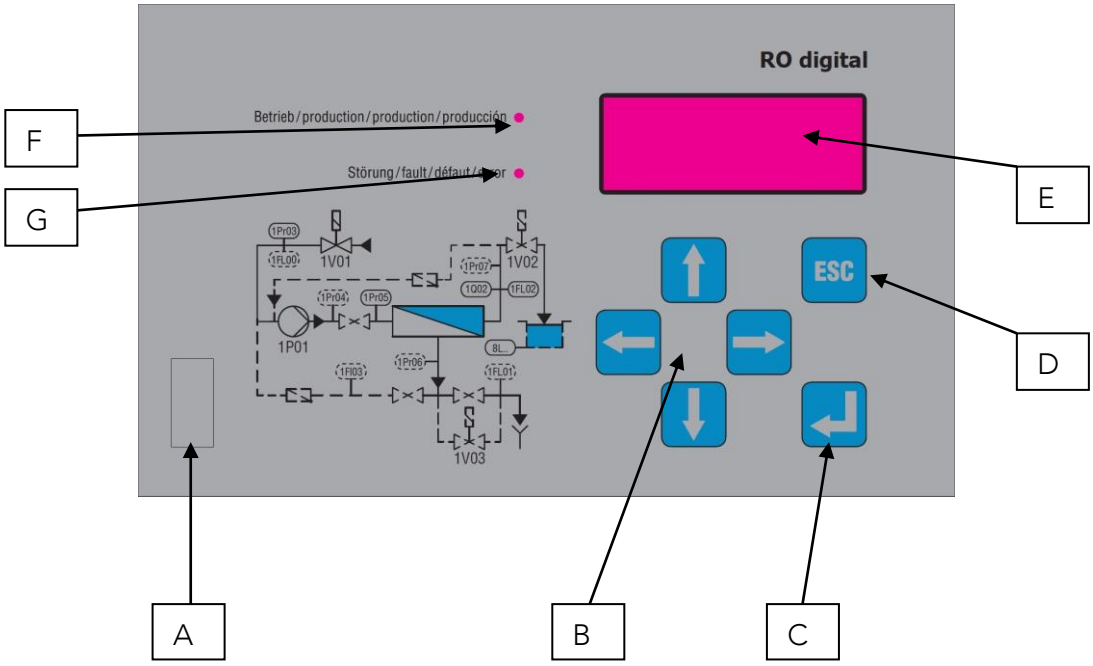
3.5 Functional diagram 11

3.6 Turning on 13

3.7 Turning off 14

1 Operating and display components

1.1 Operating and display components RO digital



	Name	Function
A	Power switch	- Turns the system on and off ➔ only with casing for top mounting
B	← ↑ → ↓	- Password entry - Menu selection - Selection
C	↵	- Confirmation of entries - Brings up a menu
D	ESC	- Quit menu - Quit malfunctions
E	Display	Displays: - current operating state - permeate conductivity / temperature - operating hours - flow rates - pressures - output states - current malfunctions
F	Operation LED (green)	System in operation
G	Malfunction LED (red)	Active malfunction

For additional information on the function and operation of the RO digital control unit, please refer to the RO digital control unit manual in the appendix of these Operating Instructions. For special machines the test report in the control cabinet should be noted.

2 Operating states

2.1 Off

- System off (all outputs inactive).
- Malfunction recording off.

2.2 Operating

2.2.1 Start

- 1V01 input valve opened
- 1P01 pump in operation
- 1V02 permeate valve (when existing) closed

Permeate is being rejected.

2.2.2 Production

- 1V01 input valve opened
- 1P01 pump in operation
  For frequency converter pumps with Option PKR:
  RO-pump 1P01 controlled to constant permeate flow.
- 1V02 permeate valve (when existing) opened

System is producing permeate.

2.2.3 Concentrate rinsing

- 1V01 input valve opened
- For P030= Displacement: 1P01 pump not in operation
  For P030= Flushing: 1P01 pump in operation
- For P280= with overflow: 1V02 permeate valve (when existing) opened
  For P280= without overflow: 1V02 permeate valve (when existing) closed
- 1V03 concentrate valve (when existing) opened

After time P031 elapses, switch over to Standby.

2.2.4 Standby

Upper level input (terminal 22, 23) opened

System in standby until request about level active again

2.2.5 Discontinous rinsing

Time-controlled forced production if the operating state STANDBY has been active for the set time (P042).

2.3 Disinfection

System is in operation, **without any safety devices**.

- 1V01 input valve opened
- 1P01 pump in operation
  For frequency converter pumps with Option PKR:
  RO-pump 1P01 controlled to constant permeate flow.
- 1V02 permeate valve (when existing) opened

System is in operation, **without any safety devices**.

2.4 Rinsing

System is in rinsing, **without any safety devices**.

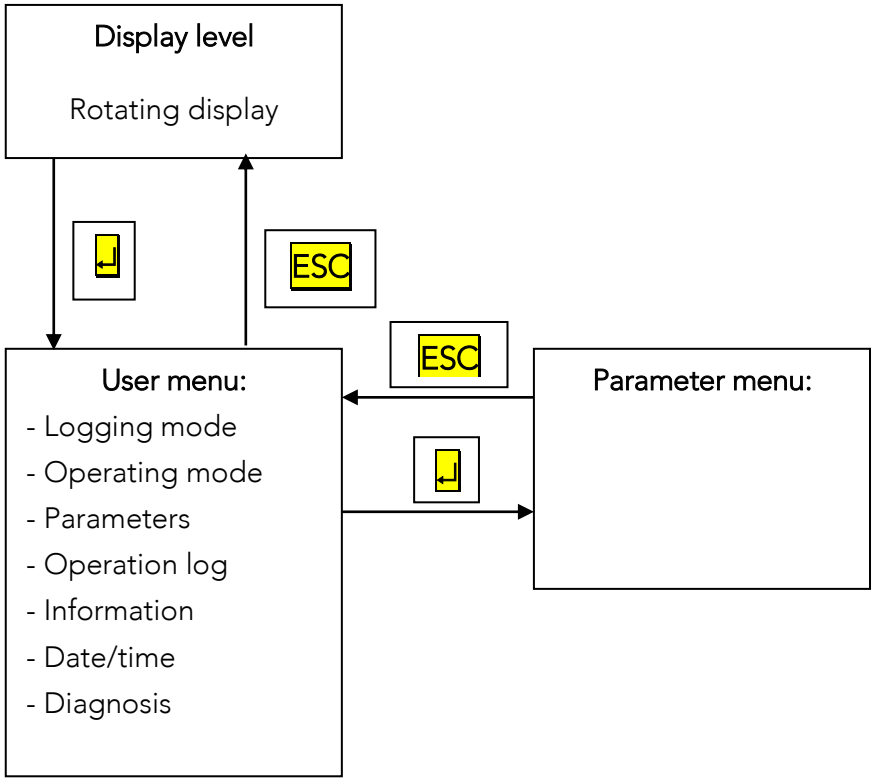
- 1V01 input valve opened
- 1P01 pump not in operation
- 1V03 concentrate valve (when existing) opened

System is in operation, **without any safety devices**.

3 Brief description of the RO digital control system

In the single chapters images of the visualization of the control system are used to illustrate the operation of the unit. The settings and values shown there are examples and are **not** applicable to an actual unit and its controller and visualization.

3.1 Menu structure



3.2 Access Authorisation

The menu items Parameters and Diagnostics, resp. the functions and settings therein are secured by a 4-digit, numeric password.
Accordingly, a distinction is made between the following two hierarchical access levels (password levels).

Access level	Name of level	Pre-set password	Password necessary for...
B	operator	„1234“	refer to chapter 9.2 in RO digital control unit manual
T	technician	„3456“	

If a password is asked for, it must be entered and confirmed with the ↵-key.

If a wrong password is entered, the menu level will not be displayed.

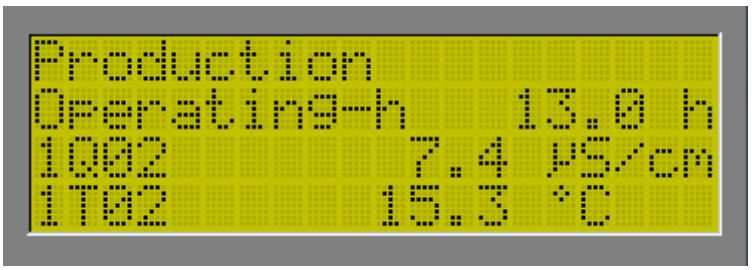
Press the ESC key to quit.

3.3 Display level (rotating display)

The integrated process visualisation allows the activated units (pump 1P01; valves 1V01, 1V02, 1V03; pressure switches 1PR03, 1Pr04, 1Pr05, 1Pr06; flow rates 1Fl00, 1Fl01, 1Fl02, 1Fl03) to be displayed on the screen. Inactive units bear a dash (–) or are not shown at all.

Note!

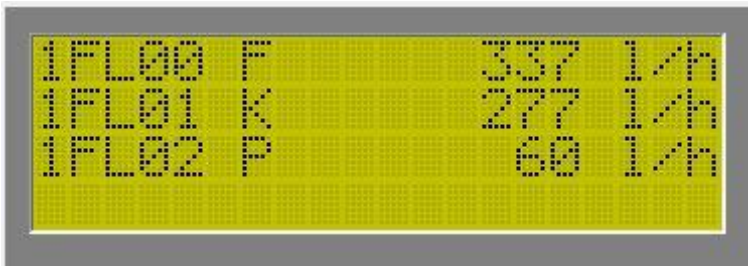
The display can be switched from rotating to fixed by using the buttons ↑ and ↓.



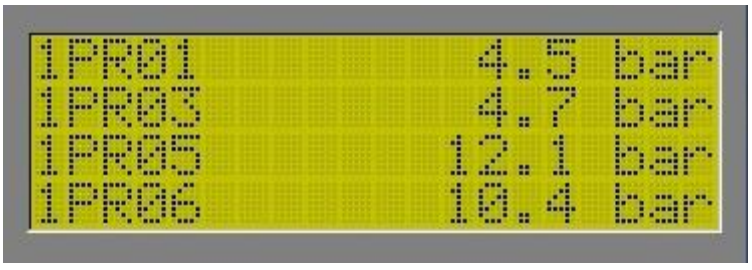
current operating state

operating hours

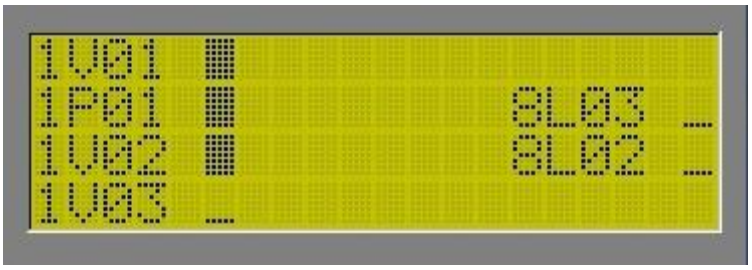
permeate conductivity and temperature r



currently measured flow rates.



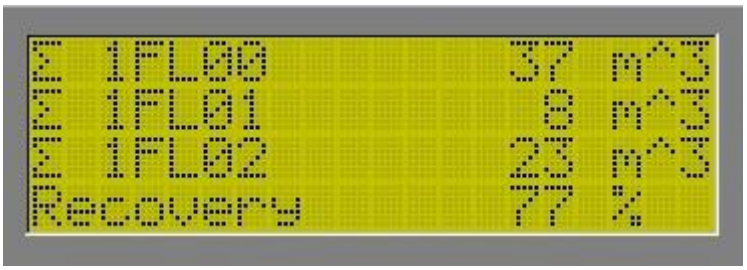
currently measured pressures.



Switching status:

_ Unit not active,

▮ Unit active.



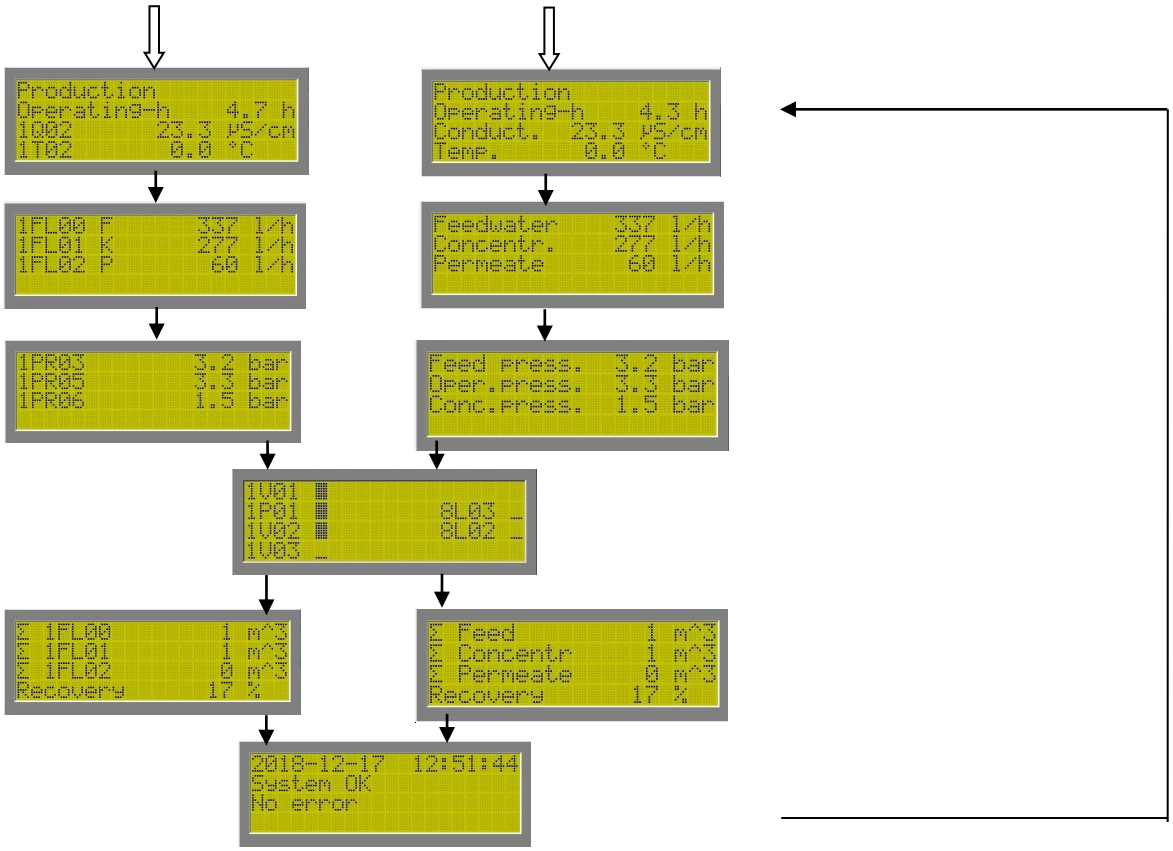
Flow volumes and recovery rate.

current date/ time, actual malfunctions.

3.3.1 Display level in plain text depiction

Below you will find explanations on the differences of the set display languages:

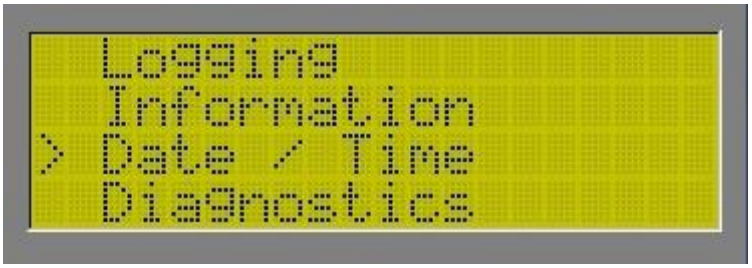
Display language: English Display language: GB-text



3.4 User-Level

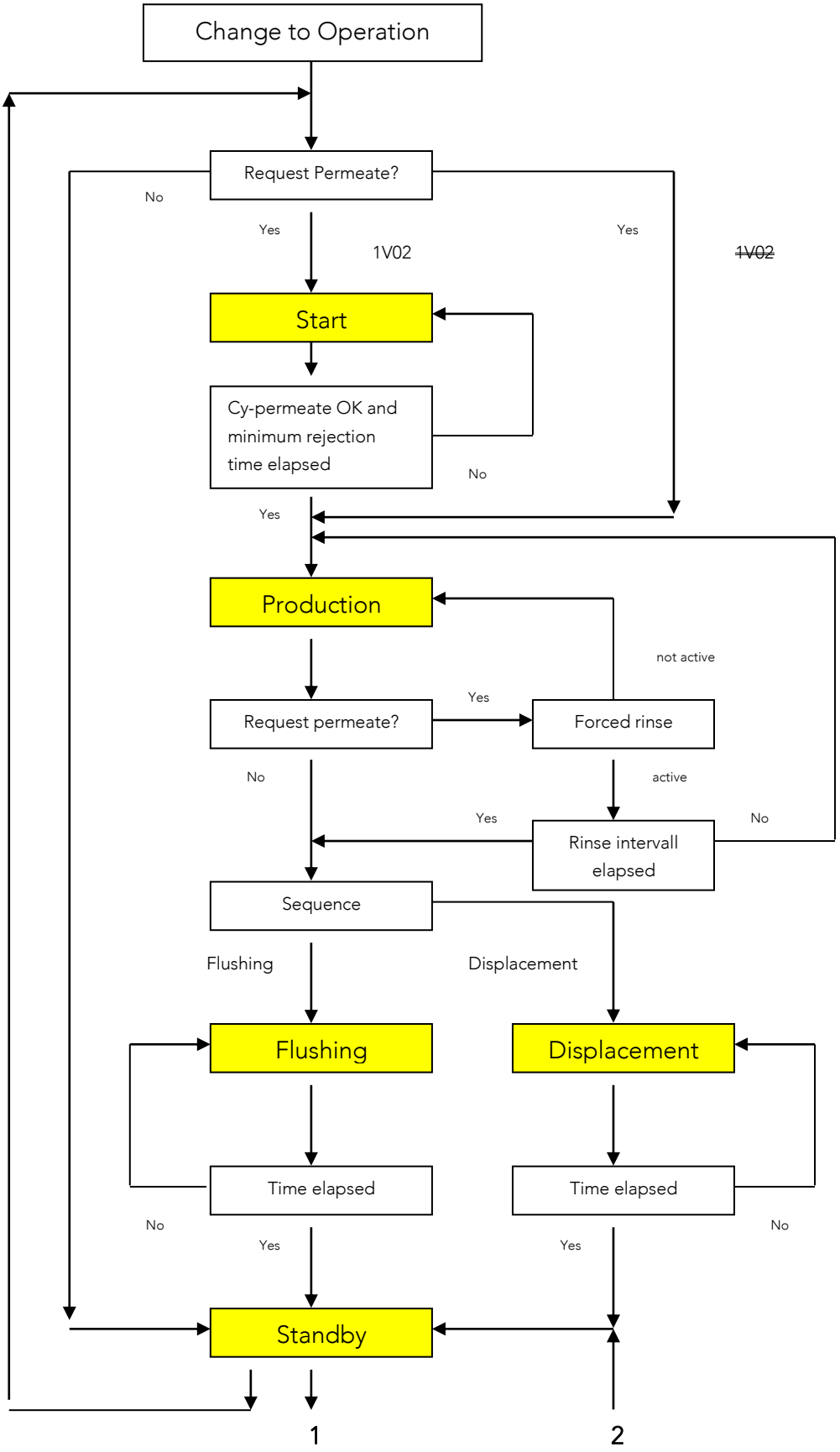
To get into user-level press the ↵-key.

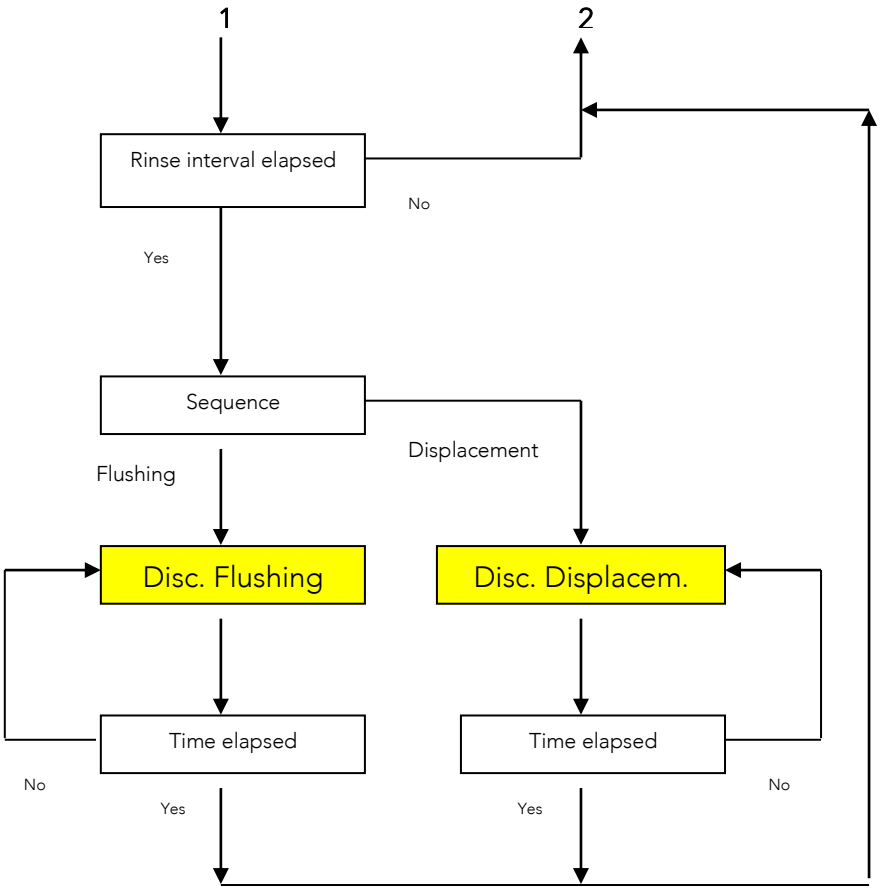
- Logging mode
- Change of operation states
- Selection of parameter level
- Selection of logging



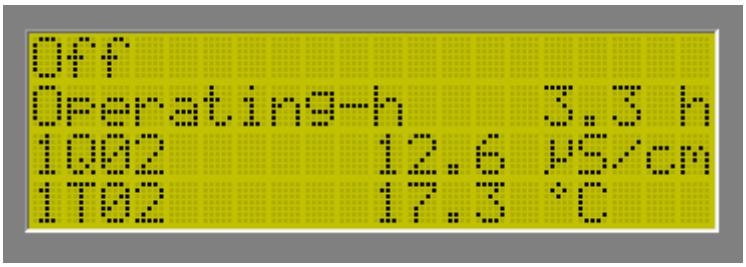
- Selection of information menu
- Setting date and time
- Selection of diagnostics menu

3.5 Functional diagram



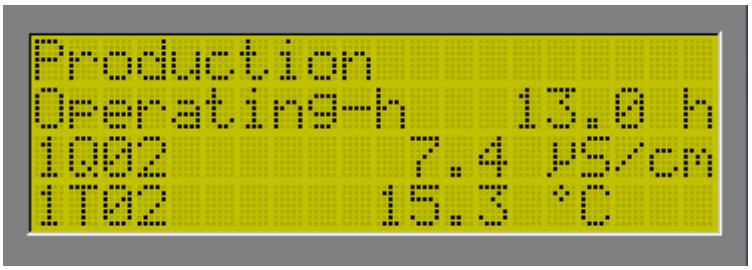

1
2
Rinse interval elapsed
No
Yes
Sequence
Displacement
Flushing
Disc. Flushing
Disc. Displacem.
Time elapsed
Time elapsed
No
Yes
Yes
No

3.6 Turning on



➔ System is running

3.7 Turning off



➔ System is shut-off

Contents Chapter G

1 General informations 2

1.1 Malfunction message to the manufacturer 2

1.2 Malfunction display 2

1.3 Malfunction reset 2

1.4 Malfunction table 3

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 records of the last 4 months

1.2 Malfunction display

- - Red malfunction LED on the control system
- - Malfunction message appears on the display

1.3 Malfunction reset

☞ ESC

Malfunction pump with frequency converter (if existing)

☞ Switch off and restart main switch

1.4 Malfunction table

Note!
According to language setting the fault message is displayed in plain text as shown in brackets hereafter.

Malfunction	Cause	Remedy
Control display dark	Power supply interrupted	Make power supply connection
	Fuse F100 (2A) defective	Replace the fuse in question
	Fuse F101 (0,5A) 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
Motor protection/ Hard water display:	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
	Motor protection switch triggered (if present)	- Check the adjustment of the motor protection switch - Check the motor
	Fault pump with FC (if present)	- Check the Motor - Switch off main switch
1Pr03 (Feed pressure low) ▼▼▼; Pressure 1Pr03<P073.1 display: **	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
1Q02 (High conductivity) ▲▲▲; 1Q02>P174 display:	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
UBATT ▼▼▼ display:	Battery flat	Replace battery
RTC failure display:	Real-time clock defective	- Reboot controller - Replace controller
Watchdog failure display:	Microcontroller defective	- Reboot controller - Replace controller
Keybord failure display:	Keyboard defective	- Reboot controller - Replace controller

**1V01 input valve opened, 1P01 pump not in operation, 1V02 permeate valve (when existing) opened. If pressure returns, system restarts automatically after 1 min. With every returning malfunction, restart time will be doubled to max. 32 min. Time delay will be reset by pressing ESC-key.

Malfunction	Cause	Remedy
System is not producing permeate	System in STANDBY even though the permeate tank is empty	Level switch defective
	System in PRODUCTION	- Pump defective - Fuse F300 defective
	Display EXTERN STOP	Connected softener is in regeneration
1Pr03 (Feed pressure high) ▲▲▲; Pressure 1Pr03>P077	Feed water pressure too high	- Check the feed booster unit - Reduce feed water pressure, if necessary, install pressure regulator into the supply water line
	Pressure switch defective	Replace pressure switch
1Fl02 (Fault permeate low) ▼▼▼; 1Fl02<P144 display:	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
	Valve position changed	Re-adjust unit
	Flow sensor defective	Replace flow sensor
Red LED at FC-pump	Malfunction of frequency-controlled pump	- check motor - switch off main switch and switch on again
1Fl02 (Fault permeate high) ▲▲▲; 1Fl02>P145 display:	Valve position changed	Re-adjust unit
	Flow sensor defective	Replace flow sensor
1Fl01 (Fault concentr. Low) ▼▼▼; 1Fl01<P134 display:	Valve position changed	Re-adjust unit
	Flow sensor defective	Replace flow sensor
1Fl01 (Fault concentr. High) ▲▲▲; 1Fl01>P135 display:	Valve position changed	Re-adjust unit
	Flow sensor defective	Replace flow sensor
1Fl03 (Fault recirc. Low) ▼▼▼; 1Fl03<P154 display:	Valve position changed	Re-adjust unit
	Flow sensor defective	Replace flow sensor
1Fl03 (Fault recirc. High) ▲▲▲; 1Fl03>P155 display:	Valve position changed	Re-adjust unit
	Flow sensor defective	Replace flow sensor
1Pr01 (Supply pressure high) ▲▲▲; 1Pr01>P063 display:	Feed water pressure too high	- Check the feed booster unit - Reduce feed water pressure, if necessary, install pressure regulator into the supply water line
	Pressure sensor defective	Replace pressure sensor

Malfunction	Cause	Remedy
1Pr04 (Pump pressure high) ▲▲▲; 1Pr04>P083 display:	Pump regulating valve closed	- Check the feed booster unit - Reduce feed water pressure, if necessary, install pressure regulator into the supply water line
	Pressure sensor defective	Replace pressure sensor
	Modules blocked	After consultation with the manufacturer: - Clean RO modules - Replace RO modules
1Pr05 (Oper. pressure high) ▲▲▲; 1Pr05>P093 display:	Valve position changed	Re-adjust unit
	Pressure sensor defective	Replace pressure sensor
	Modules blocked	After consultation with the manufacturer: - Clean RO modules - Replace RO modules
1Pr07 (Perm. pressure high) ▲▲▲; 1Pr07>P113 display:	Permeate counterpressure too high	Check permeate line
	Pressure sensor defective	Replace pressure sensor

Contents of Chapter H

1 Maintenance and monitoring tasks 2

1.1 Safety information 2

1.2 General information 2

2 Logging operating parameters 3

3 Maintenance 4

3.1 Maintenance tasks 4

3.2 Performing a concentrate rinse (water brushing) 5

Log sheet 6

Maintenance log 7

1 Maintenance and monitoring tasks

1.1 Safety information

The operator must ensure that all maintenance, monitoring and assembly tasks are performed by authorized and qualified trained personnel.
The system must be shut down and protected from being placed in operation again unintentionally before all repair and maintenance tasks.

Before beginning tasks on the electrical systems and equipment, a check must confirm that power has been disconnected from the system. In addition, the system must be secured to prevent it from being turned on again unintentionally.
Protective clothing suitable for the hazard at hand must be worn while performing the maintenance tasks.
Immediately after the maintenance tasks are completed, all safety and protective equipment must be set back in place and functionality restored.

1.2 General information

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

Signing a maintenance contract with the supplier makes it possible for the supplier to take over the responsibility of performing regular maintenance tasks on the system. A record book should be kept to record operating parameters. It is located in the appendix of these operating instructions. The purpose of this record keeping is to have continuous documentation of the operating parameters. This makes it easier to detect a drop in output or incorrect functionality of the system and then to eliminate the problem.
The documentation of maintenance tasks should be kept on the maintenance log that is provided for this purpose.

2 Logging operating parameters

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

Parameter	Measurement point/remarks
Operating hours	Control display
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 inlet pressure	1Pr01 control display
Fine filter outlet pressure	1Pr02 control display
Operating pressure	1Pr05 control display
Concentrate pressure (if existing)	1Pr06 control display
Permeate output	1FI02 control display
Concentrate output	1FI01 control display
Concentrate recirculation (if existing)	1FI03 control display
Conductivity of permeate	Control display
Temperature of permeate	Control display
Desalinization rate	For calculation see Chapter A 3.3
Absence of leaks in the system	

Minor fluctuations in the (conductivity of permeate and permeate output) are normal. The effect of the temperature or a fluctuating conductivity in supply water may be reasons for this.

When the desalinization rate drops below 95% 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 interval
Fine filter	Replace the fine filter cartridges and clean the filter housing	-3 months -if the pressure drops by 0.8 bar
Sensor hardness monitoring device (if existing)	Replace sensor	- 12 months - after triggering of sensor
- Conductivity cell(s) - pH-sensor (if existing)	Check of parameters with reference device, if necessary new calibration	- on start-up - 1 year - if quality of feed water changes
Filter mat for control cabinet fan (if existing)	Check fouling factor and clean as required	- 1 month
	Replace filter mat	- 6 month
- Rotary vane pump, 230V/ 0,25 and 0,55kW (if existing)	Exchange of pump	- 8000 working hours
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 out.

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
- ☞ Wait for 10 minutes
- ☞ Log record of actual values

Note:

If the conductivity of 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: _____

Parameter	Value PID/ Measuring point	Unit	Values when placed in service	Date	Date	Date	Date
Operating hours	Display Control	h					
Residual hardness of soft water	1V07	°dH					
Conductivity of soft water	1V07	µS/cm					
Temperature of soft water	1V07	°C					
Fine filter inlet pressure	1Pr01	bar					
Fine filter outlet pressure	1Pr02	bar					
Operating pressure	1Pr05	bar					
Concentrate pressure	1Pr06	bar					
Permeate output	1FI02	l/h					
Concentrate output	1FI01	l/h					
Concentrate recirculation (if existing)	1FI03	l/h					
Conductivity of permeate	Display Control	µS/cm					
Temperature of permeate	Display Control	°C					
Desalinization rate	-	%					
Hose connections	-	-					
Absence of leaks in the system	-	-					

Note:
Values of commissioning have to be logged, in order of further performance evaluation of the unit. Log the values weekly in **copies** of this log sheet. If there are **deviations** of more than **15%** to the commissioning values (e.g. operation pressure, differential pressure, permeate performance, desalination rate), the **supplier** has to be **contacted.**

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													
Sensor hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Filter mat for control cabinet fan (if existing)													
Accessories (if existing)													
Rotary vane pump, 230V/ 0,25 and 0,55kW													

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													
Sensor hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Filter mat for control cabinet fan (if existing)													
Accessories (if existing)													
Rotary vane pump, 230V/ 0,25 and 0,55kW													

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													
Sensor hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Filter mat for control cabinet fan (if existing)													
Accessories (if existing)													
Rotary vane pump, 230V/ 0,25 and 0,55kW													

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
Fine filter													
Sensor hardness monitoring device													
Conductivity cell pH-sensor (if existing)													
Filter mat for control cabinet fan (if existing)													
Accessories (if existing)													
Rotary vane pump, 230V/ 0,25 and 0,55kW													

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

Content of Chapter I

1 Preserving the system 2
1.1 General points 2
1.2 Preserving options 2
1.3 Materials required 2
1.4 Connecting the preservation tank 3
1.5 Preparing the preserving solution 4
1.6 Executing the preservation procedure 5
1.7 Composition of the preserving solution 5
2 Cleaning the system 6
2.1 General points 6
2.2 Materials required 6
2.3 Connecting the cleaning tank 6
2.4 Preparing the cleaning solution 7
2.5 Executing the cleaning procedure 8
2.6 Cleaning solutions 10
2.6.1 Acid cleaning 10
2.6.2 Alkali cleaning 11

1 Preserving the system

1.1 General points

After 12 months at most the preserving agent should be flushed out and replaced if necessary.

When the system is shut down for more than 30 days, it must be preserved.

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

Preservation / Cleaning is carried out by shut down of the system.

With 2 pass RO-systems, every stage will be preserved and cleaned separately.

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.

With systems of type combi (C=single water-softening unit) or (CD= duplex water-softening unit) only the RO-part is preserved. The softener will not be preserved.

Warning

The preservative solution contains 1.5% sodium bisulfite, 20% glycerine and 2.5% sodium bicarbonate. The preserving solution should be fed into the drain 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
- ☞ ready-to-use preserving agent incl. antifreeze (item. no. 530055)

1.3 Materials required

- ☞ Preserving tank with locking valve
- ☞ Connecting tubes
- ☞ Preserving/neutralization chemicals: sodium bisulphite (item no. 530058), glycerine (item no. 530024) and sodium bicarbonate (item no. 530197)
- ☞ Protective clothing (goggles, gloves, apron)

1.4 Connecting the preservation tank

- ☞ Switch off system
- ☞ Close the feed water inlet
- ☞ Set up the preservation tank (9B01) at a height to ensure that the preserving solution will flow into the RO system by gravity
- ☞ Close valves (9V01) at the preservation tank
- ☞ Detach the cut-off pipes at 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 with the feed water cut-off point of the RO system
    - Set up a tube connection between the preservation tank and the concentrate cut-off point of the RO system
    - Set up a tube connection between the preservation tank and the permeate cut-off point of the RO

1.5 Preparing the preserving solution

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 chemical sodiumbicarbonate ($NaHCO_3$), according to table 1.7, to the already filled in water in the preservation tank. Dissolve by stirring constantly.
- ☞ add the chemical sodiumbisulfite ($NaHSO_3$), according to table 1.7, in portions, stir constantly in order to prevent foaming
- ☞ add glycerine, according to table 1.7, stir constantly to homogenize the batch
- ☞ resp. fill the preservation tank with the ready-to-use preserving agent incl. antifreeze (item. no. 530055)

Important:

Chemicals should be added with caution – stir constantly.

1.6 Executing the preservation procedure

- ☞ Open the 1V06 concentrate-regulation valve and the 1V05 pressure-regulation valve completely
- ☞ Open the locking valve (9V01) on the preservation tank
- ☞ Switch the RO system to "Disinfection" operating mode (see control manual)

Attention:

System running without any safety devices.

- ☞ Let the preserving solution circulate for ten minutes
- ☞ Switch off the RO system (see control manual)
- ☞ Close the locking valve (9V01) on the preservation tank
- ☞ 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")

1.7 Composition of the preserving solution

	Permeate output of the system (l/h)	**Soft water supply** (l)	**Sodium bisulphite powder** (kg)	**Glycerine** (l)	**Sodium-bicarbonate** (kg)
item no.			530 058	530 024	530 197
conc. of chemicals			97%	86,5%	
conc. in preserving solution			1,5% w/w	20% v/v	2,5% w/w
	- 500	20	0,39	5,8	0,63
	550 - 1500	50	0,97	14,5	1,6
	1550 - 3500	100	1,93	29,0	3,1
	3550 - 9500	200	3,87	58,0	6,25
	9550 -12.000	250	4,84	72,5	7,8
	12.050 - 17.000	300	5,80	87	9,4
	17.050 – 20.000	400	7,74	116	12,5
	20.050 - 30.000	500	9,67	145	15,6

The pH value of the preserving solution is about 7.

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.

Cleaning solution shall 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 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 shall 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

- ☞ Open the 1V06 concentrate-regulation valve and the 1V05 pressure-regulation valve completely
- ☞ Open the locking valve (9V01) on the cleaning tank 9B01
- ☞ Switch the RO system to "Disinfection" operating mode (see control manual)

Attention:

System running without any safety devices.

Application time for 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 (9V01) on the cleaning tank
- ☞ Take notice of the sufficient contact time of 12h for the alkaline cleansing agent A12
- ☞ Dispose of cleaning solution (see 1.1, "General points")

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. The flushing fluid that accumulates, may be discarded batch wise (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

Do not terminate the cleaning procedure until the pH value of the concentrate is the same as the pH value of the feed water. The typical pH-value after neutralisation is about 6.5-9.

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.

If cleaning of the RO-unit is carried out via a manual cleaning unit (MRA) , each component of the MRA (incl. pump) shows resistance against the cleansing detergents mentioned here.

Nevertheless, the MRA has to be rinsed clear after each cleaning. Use water to flush out any detergent residues. Finish rinsing when the rinsing water shows pH-neutrality.

2.6 Cleaning solutions

2.6.1 Acid cleaning

	Permeate output of the system (l/h)	**Soft water supply** (l)	**optimal** **Cleansing agent S2** (kg) alternatively citric acid
item no.			**530 183**
conc. of chemicals			100%
	- 500	50	1,0
	550 - 1500	100	2,0
	1550 - 3500	200	4,0
	3550 - 9500	300	6,0
	9550 -12.000	400	8,0
	12.050 - 17.000	500	10,0
	17.050 – 20.000	700	14,0
	20.050 - 30.000	1000	20,0

The pH value of the cleansing agent solution is about 2.
It should not be allowed to fall below this level.
Note the safety data sheet of the cleansing agent.

2.6.2 Alkali cleaning

			optimal		alternatively	
			normal fouling	**heavy fouling**		
	Permeate output of the system (l/h)	**Soft water supply** (l)	**Cleansing agent A12 1%** (kg)	**Cleansing agent A12 2%** (kg)	**Sodium-dodecylsulfate** (g)	**NaOH flakes** (g)
item no.			530 177	530177	530 021	530027
conc. of chemicals			100%	100%	90%	100%
	- 500	50	0,5	1,0	15	50
	550 - 1500	100	1,0	2,0	30	100
	1550 - 3500	200	2,0	4,0	60	200
	3550 - 9500	300	3,0	6,0	90	300
	9550 -12.000	400	4,0	8,0	120	400
	12.050 - 17.000	500	5,0	10,0	150	500
	17.050 – 20.000	700	7,0	14,0	210	700
	20.050 - 30.000	1000	10,0	20,0	300	1000

Warning

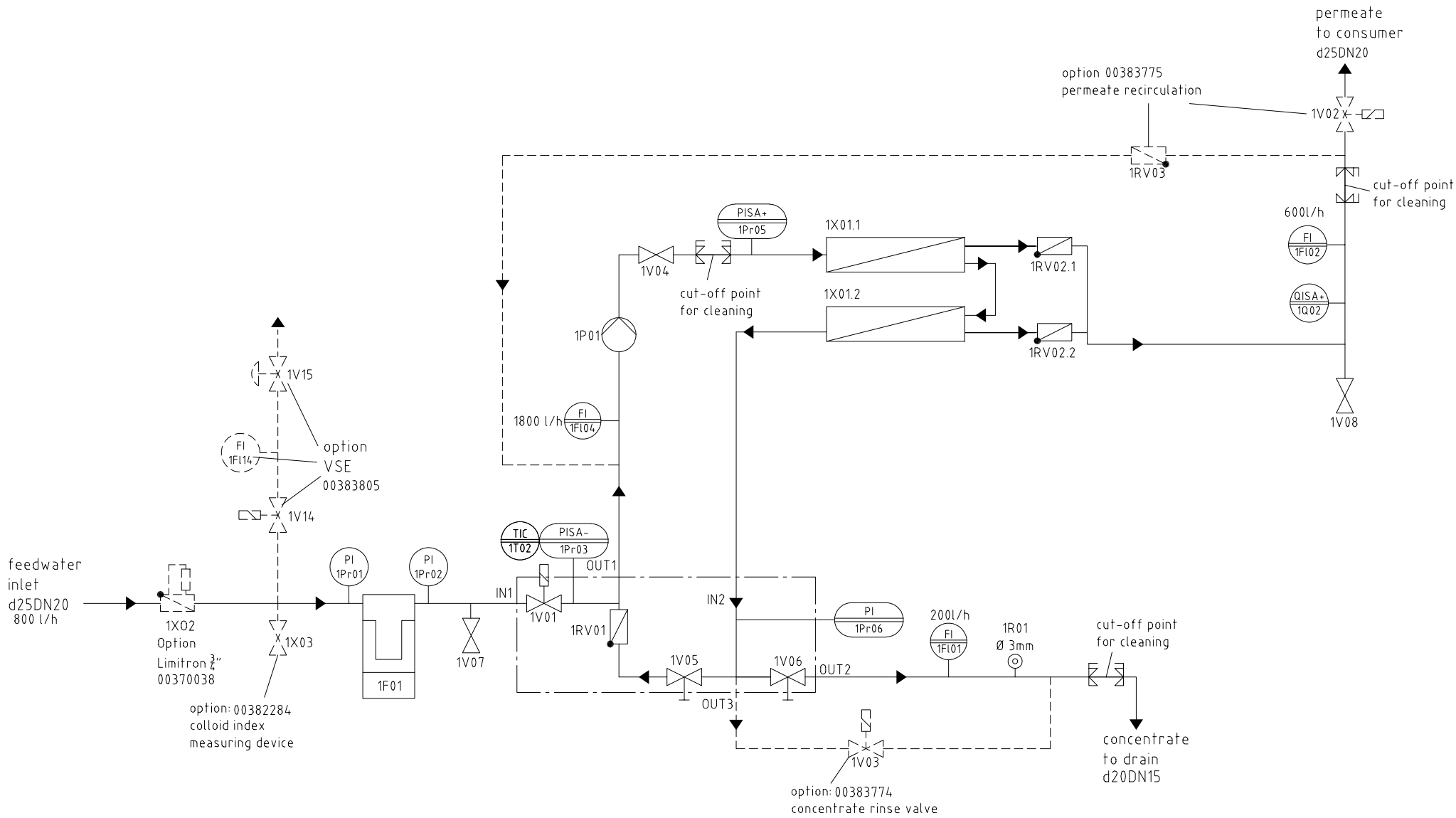
The pH value of the cleansing agent solution is about 12.
It should not be allowed to fall below this level.
Note the safety data sheet of the cleansing agent.

Note the following advices for the application of cleansing agent A12.
The sufficient contact time for the alkaline cleansing agent A12 is 12h.
After cleaning procedure use either cleansing agent S2 or citric acid for neutralization. The typical pH value after neutralization is about 6.5-9.

In case of extensive formation of foam during application of cleansing agent A12, use defoam fluid. (item no. 530185)

Caution

Use only this mentioned defoam liquid. Other defoam liquids may destroy the RO-unit´s membranes.



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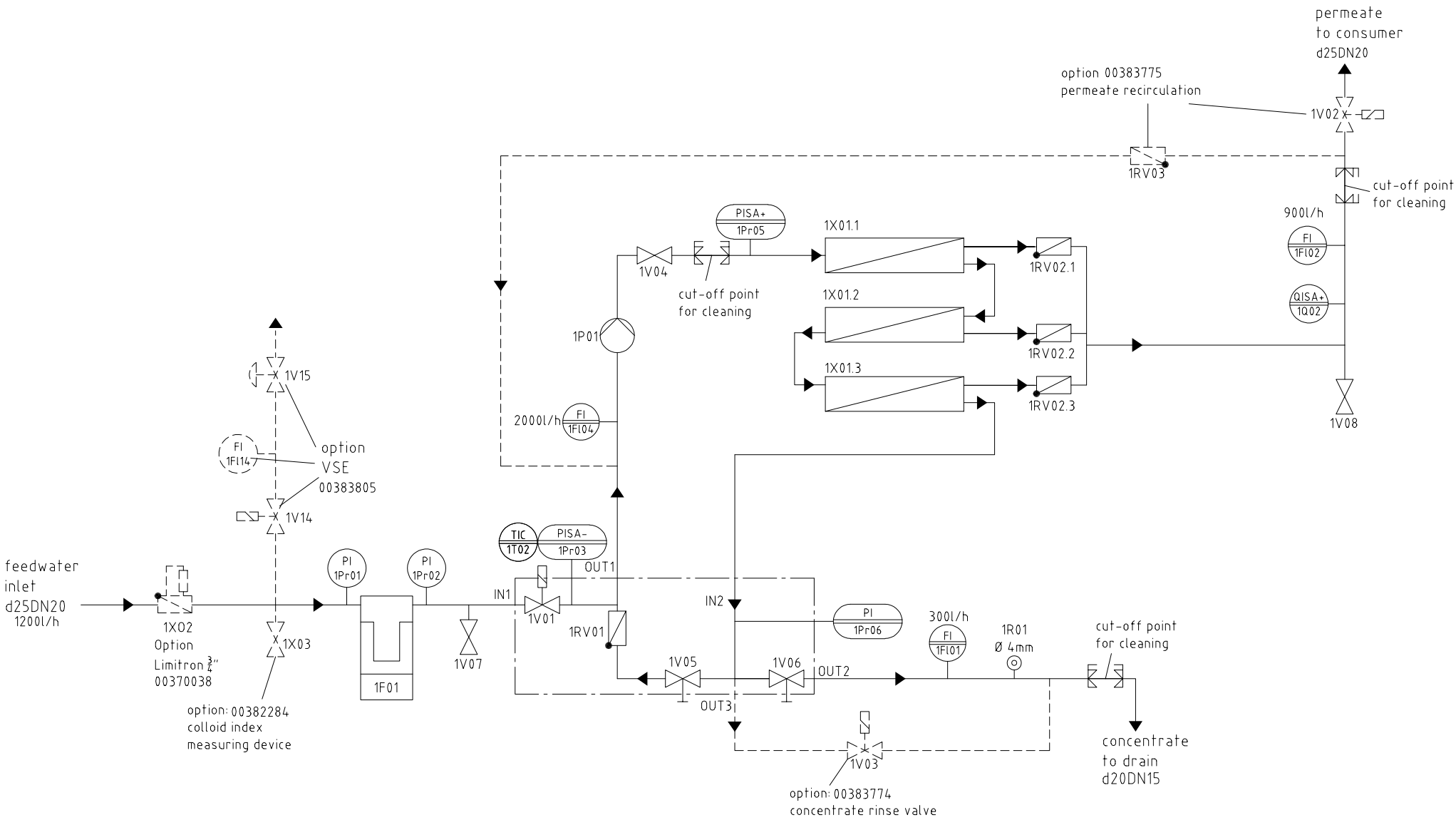
							Position – Menge –
							–
							– –
					Datum	Name	
				Bearb.	22.04.2016	eng	UO-D 600
				Gepr.	22.04.2016	eng	----
				Norm			
D	DR geä. zu FirstLine	12.11.2020	eng				
C	1FI01/02/04	29.04.2019	eng				00387151-30000
B	1T02 von 1FI02 nach 1Pr03	09.01.2019	rei				Blatt
A	1F01, 1V07	05.09.2017	eng				Bl
Rev.	Änderung	Datum	Name	EDV Nr. 00387151-30000.dwg			



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						– / – / –
					Datum	Name
				Bearb.	22.04.2016	eng
				Gepr.	22.04.2016	eng
				Norm		
D	DR geä. zu FirstLine	12.11.2020	eng			
C	1Fl01/02/04 1T02 von 1Fl02 nach 1Pr03	29.04.2019	eng			
B	1F01, 1V07	09.01.2019	rei			
A		05.09.2017	eng			
Rev.	Änderung	Datum	Name	EDV Nr. 00387152-30000.dwg		

UO-D 900

00387152-30000

Blatt

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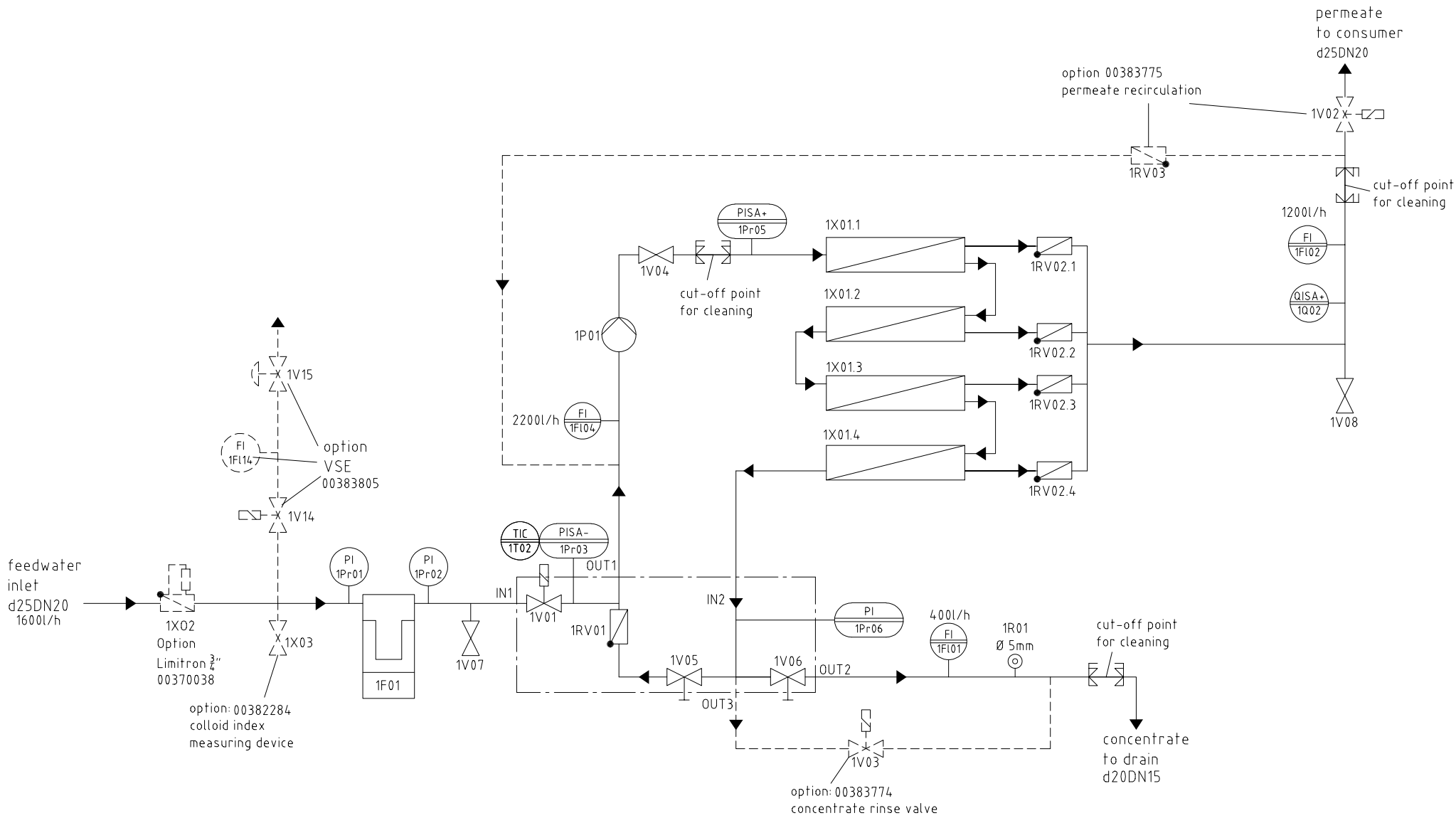

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						Position – Menge –
						– – –
					Datum	Name
				Bearb.	22.04.2016	eng
				Gepr.	22.04.2016	eng
				Norm		
D	DR geä. zu FirstLine	12.11.2020	eng			
C	1Fl01/02/04	29.04.2019	eng			
B	1T02 von 1Fl02 nach 1Pr03	09.01.2019	rei			
A	1F01, 1V07	05.09.2017	eng			
Rev.	Änderung	Datum	Name	EDV Nr. 00387153-30000.dwg		

UO-D 1200

00387153-30000

Blatt

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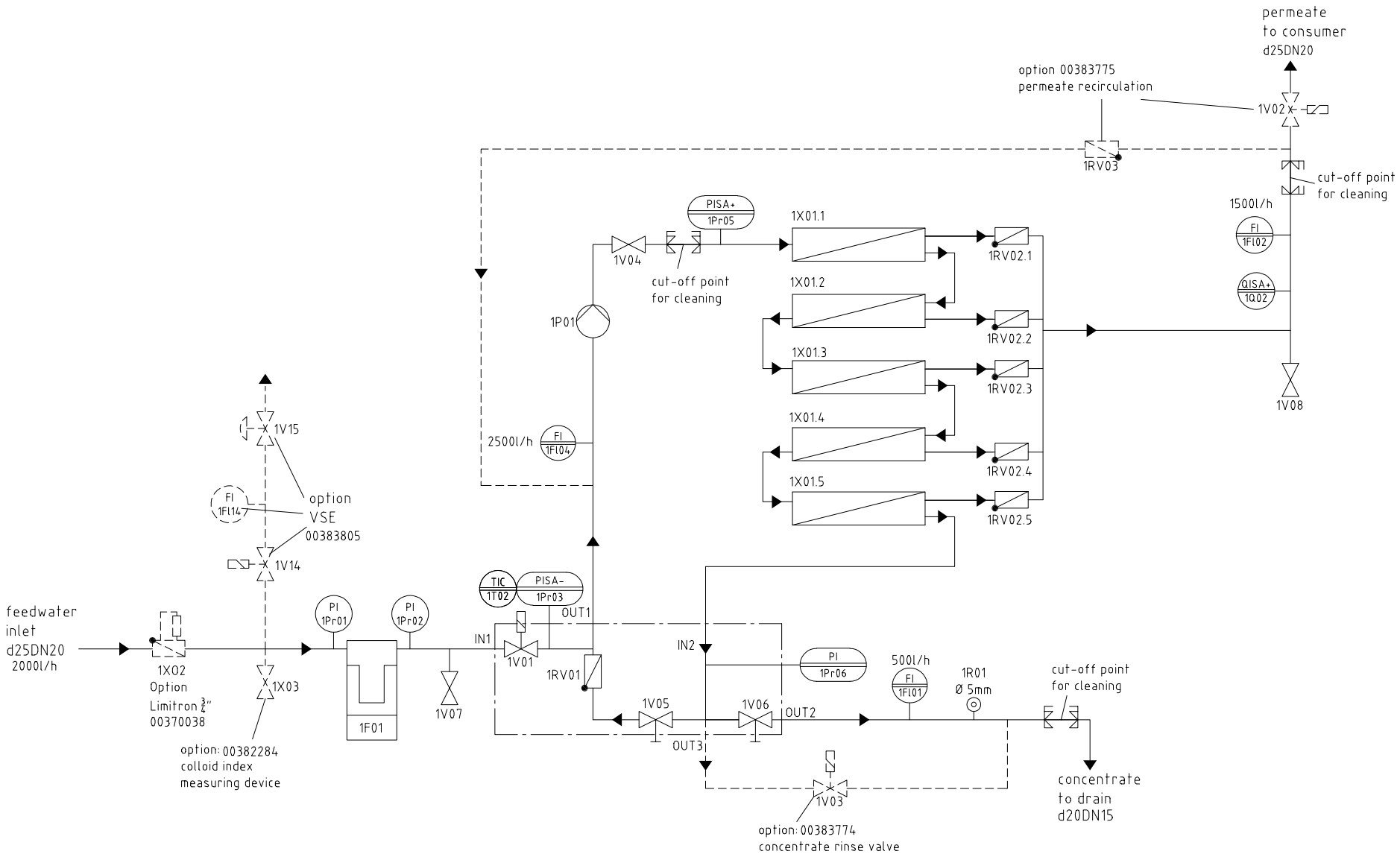

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						– – –
					Datum	Name
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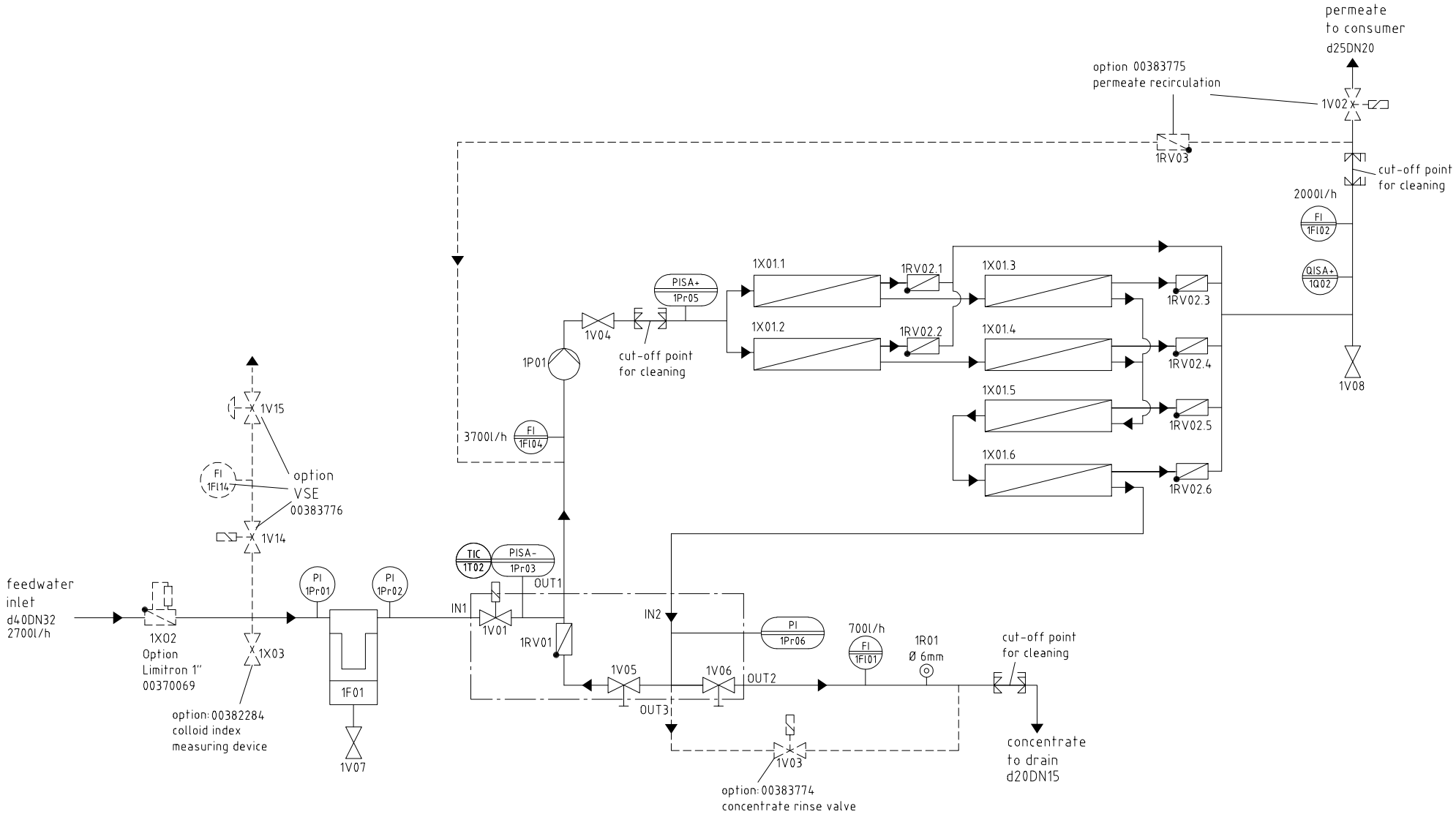
				Gepr.	22.04.2016	eng
				Norm		
D	DR geä. zu FirstLine	12.11.2020	eng			UO-D 1500
C	1FI01/02/04 1T02 von 1Ft02 nach 1Pr03	30.04.2019	eng			----
B	1Pr03	09.01.2019	rei			
A	1F01, 1V07	05.09.2017	eng			00387154-30000
Rev.	Änderung	Datum	Name	EDV Nr. 00387154-30000.dwg		Blatt Bl



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				Gepr.	22.04.2016	eng
				Norm		
D	1V02	25.08.2021	rei			
C	DR geä. zu FirstLine	12.11.2020	eng			
B	1FI01/02/04	30.04.2019	eng			
A	~~1T02 von 1Ft02 nach 1Pr03~~	09.01.2019	rei			
Rev.	Änderung	Datum	Name	EDV Nr. 00387155-30000.dwg		

UO-D 2000

00387155-30000

Blatt Bl

spare part list

item: **UO-D 600**

item-no: **00 387 151**

item-no.	position (P+ID)	quantity	unity	w/s*	description	additional details
00 335 014	1F01	1	pcs	w	filter cartridge	10", 5 µm
00 630 565	1FL01	1	pcs	E	flow rate sensor HUBA 4-20mA	DN08
00 630 566	1FL02	1	pcs	E	flow rate sensor HUBA 4-20mA	DN10
00 630 587	1FL04	1	pcs	E	flow rate sensor HUBA 4-20mA	DN20
00 390 227	1P01	1	pcs	s	pump CR3-19	1,5 kW, 3x400V/50Hz
00 390 242	1P01	1	pcs	s	slide ring seal	for CR, CRN, CRI (E) 1,3, 5
00 630 563	1Pr01 1Pr02	2	pcs	s	pressure gauge	0-10 bar
00 630 412	1PR03	1	pcs	s	pressure sensor	0-10 bar
00 630 551	1Pr05	1	pcs	s	pressure sensor	0-25 bar
00 630 420	1Pr06	1	pcs	s	pressure sensor	0-25 bar
00 100 066	1Q02	1	pcs	s	measuring cell	114OR, ¼" µS/cm
00 410 242	1V01	1	pcs	s	solenoid valve	24V/DC
00 650 355	1X01	2	pcs	w	O-ring-set for pressure vessel	4", GFK 4040-1
00 395 146	1X01	2	pcs	w	membrane modul 4040 ND	originally packed max. storage time: 6 months
00 545 466		1	pcs	s	control	RO digital
00 383 163		1	pcs	s	foil for control	RO digital
00 540 706		10	pcs	s	micro-fuse	6,3 A T
00 541 150		1	pcs	s	micro-fuse	0,5 A T
00 541 791		10	pcs	s	micro-fuse	3,15 A T
00 541 792		10	pcs	s	micro-fuse	2,0 A T
spare parts for options						
00 405 125	1V02	1	pcs	s	solenoid valve	1", PA, 24V/DC
00 410 127	1V03	1	pcs	s	solenoid valve	½", brass, 24V/DC
00 410 107	1V14	1	pcs	s	solenoid valve	½", Ms, 230V/50Hz
00 395 147	1X01	2	pcs	w	membrane modul 4040 HR	originally packed max. storage time: 6 months
00 370 031	1X02	1	pcs	w	sensor for Limitron and Limitent	originally packed max. storage time: 6 months
00 370 034		1	pcs	s	head part for Limitron	
00 370 035		1	pcs	s	foot part for Limitron	
00 300 007	1X03	1	pcs	s	filter for measuring device for blocking index VIM	
00 335 054		100	pcs	w	filter membranes for VIM	0,45 µm

revision	date	name	
1FL01/02/04	29.04.19	Eng	
1X01	03.03.21	Rei	*w = wear part
			s = spare part

spare part list

item: **UO-D 900**

item-no: **00 387 152**

item-no.	position (P+ID)	quantity	unity	w/s*	description	additional details
00 335 014	1F01	1	pcs	w	filter cartridge	10", 5 µm
00 630 565	1FL01	1	pcs	s	flow rate sensor HUBA 4-20mA	DN08
00 630 566	1FL02	1	pcs	s	flow rate sensor HUBA 4-20mA	DN10
00 630 587	1FL04	1	pcs	s	flow rate sensor HUBA 4-20mA	DN20
00 390 227	1P01	1	pcs	s	pump CR3-19	1,5 kW, 3x400V/50Hz
00 390 242	1P01	1	pcs	s	slide ring seal	for CR, CRN, CRI (E) 1,3, 5
00 630 563	1Pr01 1Pr02	2	pcs	s	pressure gauge	0-10 bar
00 630 412	1PR03	1	pcs	s	pressure sensor	0-10 bar
00 630 551	1Pr05	1	pcs	s	pressure sensor	0-25 bar
00 630 420	1Pr06	1	pcs	s	pressure sensor	0-25 bar
00 100 066	1Q02	1	pcs	s	measuring cell	114OR, ¼" µS/cm
00 410 242	1V01	1	pcs	s	solenoid valve	24V/DC
00 650 355	1X01	3	pcs	w	O-ring-set for pressure vessel	4", GFK 4040-1
00 395 146	1X01	3	pcs	w	membrane modul 4040 ND	originally packed max. storage time: 6 months
00 545 466		1	pcs	s	control	RO digital
00 383 163		1	pcs	s	foil for control	RO digital
00 540 706		10	pcs	s	micro-fuse	6,3 A T
00 541 150		1	pcs	s	micro-fuse	0,5 A T
00 541 791		10	pcs	s	micro-fuse	3,15 A T
00 541 792		10	pcs	s	micro-fuse	2,0 A T
spare parts for options						
00 405 125	1V02	1	pcs	s	solenoid valve	1", PA, 24V/DC
00 410 127	1V03	1	pcs	s	solenoid valve	½", brass, 24V/DC
00 410 107	1V14	1	pcs	s	solenoid valve	½", Ms, 230V/50Hz
00 395 147	1X01	3	pcs	w	membrane modul 4040 HR	originally packed max. storage time: 6 months
00 370 031	1X02	1	pcs	w	sensor for Limitron and Limitent	originally packed max. storage time: 6 months
00 370 034		1	pcs	s	head part for Limitron	
00 370 035		1	pcs	s	foot part for Limitron	
00 300 007	1X03	1	pcs	s	filter for measuring device for blocking index VIM	
00 335 054		100	pcs	w	filter membranes for VIM	0,45 µm

revision	date	name	
1Fl01/02/04	29.04.19	Eng	
1X01	03.03.21	Rei	*w = wear part
			s = spare part

spare part list

item: **UO-D 1200**

item-no: **00 387 153**

item-no.	position (P+ID)	quantity	unity	w/s*	description	additional details
00 335 014	1F01	1	pcs	w	filter cartridge	10", 5 µm
00 630 566	1FL01	1	pcs	s	flow rate sensor HUBA 4-20 mA	DN10
00 630 630	1FL02	1	pcs	s	flow rate sensor HUBA 4-20 mA	DN15
00 630 587	1FL04	1	pcs	s	flow rate sensor HUBA 4-20 mA	DN20
00 390 231	1P01	1	pcs	s	pump CR 3-21	2,2 kW, 3x400V/50Hz
00 390 242	1P01	1	pcs	s	slide ring seal	for CR, CRN, CRI (E) 1,3, 5
00 630 563	1Pr01 1Pr02	2	pcs	s	pressure gauge	0-10 bar
00 630 412	1PR03	1	pcs	s	pressure sensor	0-10 bar
00 630 551	1Pr05	1	pcs	s	pressure sensor	0-25 bar
00 630 420	1Pr06	1	pcs	s	pressure sensor	0-25 bar
00 100 066	1Q02	1	pcs	s	measuring cell	114OR, ¼" µS/cm
00 410 242	1V01	1	pcs	s	solenoid valve	24V/DC
00 650 355	1X01	4	pcs	w	O-ring-set for pressure vessel	4", GFK 4040-1
00 395 146	1X01	4	pcs	w	membrane modul 4040 ND	originally packed max. storage time: 6 months
00 545 466		1	pcs	s	control	RO digital
00 383 163		1	pcs	s	foil for control	RO digital
00 540 706		10	pcs	s	micro-fuse	6,3 A T
00 541 150		1	pcs	s	micro-fuse	0,5 A T
00 541 791		10	pcs	s	micro-fuse	3,15 A T
00 541 792		10	pcs	s	micro-fuse	2,0 A T
spare parts for options						
00 405 125	1V02	1	pcs	s	solenoid valve	1", PA, 24V/DC
00 410 127	1V03	1	pcs	s	solenoid valve	½", brass, 24V/DC
00 410 107	1V14	1	pcs	s	solenoid valve	½", Ms, 230V/50Hz
00 395 147	1X01	4	pcs	w	membrane modul 4040 HR	originally packed max. storage time: 6 months
00 370 031	1X02	1	pcs	w	sensor for Limitron and Limitent	originally packed max. storage time: 6 months
00 370 034		1	pcs	s	head part for Limitron	
00 370 035		1	pcs	s	foot part for Limitron	
00 300 007	1X03	1	pcs	s	filter for measuring device for blocking index VIM	
00 335 054		100	pcs	w	filter membranes for VIM	0,45 µm

revision	date	name	
1Fl01/02/04	29.04.19	Eng	
1X01	03.03.21	Rei	*w = wear part
			s = spare part

spare part list

item: **UO-D 1500**

item-no: **00 387 154**

item-no.	position (P+ID)	quantity	unity	w/s*	description	additional details
00 335 014	1F01	1	pcs	w	filter cartridge	10", 5 µm
00 630 566	1FL01	1	pcs	s	flow rate sensor HUBA 4-20 mA	DN10
00 630 630	1FL02	1	pcs	s	flow rate sensor HUBA 4-20 mA	DN15
00 630 587	1FL04	1	pcs	s	flow rate sensor HUBA 4-20 mA	DN20
00 390 228	1P01	1	pcs	s	pump CR3-25	2,2 kW, 3x400V/50Hz
00 390 242	1P01	1	pcs	s	slide ring seal	for CR, CRN, CRI (E) 1,3, 5
00 630 563	1Pr01 1Pr02	2	pcs	s	pressure gauge	0-10 bar
00 630 412	1PR03	1	pcs	s	pressure sensor	0-10 bar
00 630 551	1Pr05	1	pcs	s	pressure sensor	0-25 bar
00 630 420	1Pr06	1	pcs	s	pressure sensor	0-25 bar
00 100 066	1Q02	1	pcs	s	measuring cell	114OR, ¼" µS/cm
00 410 242	1V01	1	pcs	s	solenoid valve	24V/DC
00 650 355	1X01	5	pcs	w	O-ring-set for pressure vessel	4", GFK 4040-1
00 395 146	1X01	5	pcs	w	membrane modul 4040 ND	originally packed max. storage time: 6 months
00 545 466		1	pcs	s	control	RO digital
00 383 163		1	pcs	s	foil for control	RO digital
00 540 706		10	pcs	s	micro-fuse	6,3 A T
00 541 150		1	pcs	s	micro-fuse	0,5 A T
00 541 791		10	pcs	s	micro-fuse	3,15 A T
00 541 792		10	pcs	s	micro-fuse	2,0 A T
spare parts for options						
00 405 125	1V02	1	pcs	s	solenoid valve	1", PA, 24V/DC
00 410 127	1V03	1	pcs	s	solenoid valve	½", brass, 24V/DC
00 410 107	1V14	1	pcs	s	solenoid valve	½", Ms, 230V/50Hz
00 395 147	1X01	5	pcs	w	membrane modul 4040 HR	originally packed max. storage time: 6 months
00 370 031	1X02	1	pcs	w	sensor for Limitron and Limitent	originally packed max. storage time: 6 months
00 370 034		1	pcs	s	head part for Limitron	
00 370 035		1	pcs	s	foot part for Limitron	
00 300 007	1X03	1	pcs	s	filter for measuring device for blocking index VIM	
00 335 054		100	pcs	w	filter membranes for VIM	0,45 µm

revision	date	name	
1Fl01/02/04	30.04.19	Eng	
1X01	03.03.21	Rei	*w = wear part
			s = spare part

spare part list

item: **UO-D 2000**

item-no: **00 387 155**

item-no.	position (P+ID)	quantity	unity	w/s*	description	additional details
00 335 101	1F01	1	pcs	w	filter cartridge	10", 5 µm, BB
00 630 566	1FL01	1	pcs	s	flow rate sensor HUBA 4-20 mA	DN10
00 630 630	1FL02	1	pcs	s	flow rate sensor HUBA 4-20 mA	DN15
00 630 587	1FL04	1	pcs	s	flow rate sensor HUBA 4-20 mA	DN20
00 390 215	1P01	1	pcs	s	pump CR3-36	3 kW, 3x400V/50Hz
00 390 242	1P01	1	pcs	s	slide ring seal	for CR, CRN, CRI (E) 1,3, 5
00 630 563	1Pr01 1Pr02	2	pcs	s	pressure gauge	0-10 bar
00 630 412	1PR03	1	pcs	s	pressure sensor	0-10 bar
00 630 551	1Pr05	1	pcs	s	pressure sensor	0-25 bar
00 630 420	1Pr06	1	pcs	s	pressure sensor	0-25 bar
00 100 066	1Q02	1	pcs	s	measuring cell	114OR, ¼" µS/cm
00 410 242	1V01	1	pcs	s	solenoid valve	24V/DC
00 650 355	1X01	6	pcs	w	O-ring-set for pressure vessel	4", GFK 4040-1
00 395 146	1X01	6	pcs	w	membrane modul 4040 ND	originally packed max. storage time: 6 months
00 545 466		1	pcs	s	control	RO digital
00 383 163		1	pcs	s	foil for control	RO digital
00 540 706		10	pcs	s	micro-fuse	6,3 A T
00 541 150		1	pcs	s	micro-fuse	0,5 A T
00 541 791		10	pcs	s	micro-fuse	3,15 A T
00 541 792		10	pcs	s	micro-fuse	2,0 A T
spare parts for options						
00 405 125	1V02	1	pcs	s	solenoid valve	1", PA, 24V/DC
00 410 127	1V03	1	pcs	s	solenoid valve	½", brass, 24V/DC
00 410 098	1V14	1	pcs	s	solenoid valve	1", Ms, 230V/50Hz
00 395 147	1X01	6	pcs	w	membrane modul 4040 HR	originally packed max. storage time: 6 months
00 370 031	1X02	1	pcs	w	sensor for Limitron and Limitent	originally packed max. storage time: 6 months
00 370 034		1	pcs	s	head part for Limitron	
00 370 035		1	pcs	s	foot part for Limitron	
00 300 007	1X03	1	pcs	s	filter for measuring device for blocking index VIM	
00 335 054		100	pcs	w	filter membranes for VIM	0,45 µm

revision	date	name	
1Fl01/02/04	30.04.19	Eng	
1X01	03.03.21	Rei	*w = wear part
			s = spare part

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1 2 3 4 5 6 7 8

Beschreibung Description	UO-D 600-2000 (CD)
Versorgungsspannung supply voltage	3x400V/50Hz, PE
Vorsicherung Fuse protection	20 A
Steuerspannung control voltage 1	230 VAC
Steuerspannung control voltage 2	24 VDC
Mind. Zuleitung mini. Power cable	5x2,5 mm²
max. Strom max. current	siehe Seite see page 3

	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Deckblatt
cover sheet

Projektbez.
UO-D 600-2000 (CD)

Auftragsnr.

Zeichnungsnr.
545802-01001

Blatt 1
12 Bl.

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Projekt Information
Project Information

Schaltschrankausführung
control cabinet assembly

Hersteller manufacturer	Schneider Electric GmbH
Maße dimensions	400x400x200 mm
Schutzart protection type	IP 54

Vorsicherung
Fuse protection :

Sicherung Fuse	Aderndimensionierung wire dimensions	Wago Klemmen Wago connector
16A	1,5 mm2	2002
20A	2,5 mm2	2002
25A	4 mm2	2002
32A	6 mm2	2004
40A	10 mm2	2006
50A	10 mm2	2006
63A	16 mm2	2016
80A	25 mm2	2016
100A	35 mm2	---

Verdrahtungsfarben
wiring colours

Hauptstromkreis main circuit	schwarz black	1,5–35 mm²
N–Leiter N–conductor	hellblau light blue	1,5–35 mm²
Schutzleiter protective conductor	grün/gelb green/yellow	1,5–35 mm²
Steuerspannung control voltage 230VAC	rot red	0,75 mm²
Steuerspannung control voltage 0VAC	rot/weiß red/white	0,75 mm²
Steuerspannung control voltage 24VDC	dunkelblau dark blue	0,75 mm²
Steuerspannung control voltage 0VDC	grau gray	0,75 mm²
Dig. Eing. Microcontroller Dig. Input microcontroller	violett purple	0,75 mm²
Dig. Ausg. Microcontroler Dig. Output microcontroller	Siehe oben Steuerspannung see the control voltage	0,75 mm²
Analoge Messleitung + analog measuring circuit +	weiß white	0,75 mm²
Analoge Messleitung – analog measuring circuit –	weiß/blau white/blue	0,75 mm²
Analoge Leitung Microcontroller analog cable microcontroller	weiß white	0,75 mm²
Fremdspannung external voltage	orange orange	0,75 mm²

	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Projekt Information
Project Information

Projektbez.
UO–D 600–2000 (CD)

Auftragsnr.

Zeichnungsnr.
545802–01001

Blatt 2
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1P01	Einstellung Q2 adjustment Q2	max. Strom max. current
1,5 kW	3,2 A	3,7 A
2,2 kW	4,5 A	5,0 A
3 kW	6,3 A	6,8 A
4 kW	8,0 A	8,5 A

Q1 Hauptschalter main switch

Q2 /6.2

Q3 0,4–0,6A 0,5A

T1 160VA 400V 230V

K1 /5.2

LO1/4.1

NO1/4.1

PE/4.1

Montageplatte mounting plate

Schaltschrank control cabinet

Türe door

Rahmen frame

Kundenseitiger Anschluss
3x 400V/50Hz
Vorsicherung max. 20A
Power supply by customer
3x 400V/50Hz
fuse protection max. 20A

1P01 U0–Pumpe R0–pump

0X02 Enthärter softener (CD) Max. 100VA

0P01 Einspeisung power supply

Dosierpumpe dosing pump Option option

Nur eine Option möglich just one option is allowed

Limitron Option option LN

*Bei Entfernen der Brücke ist ein Isolationswächter nach VDE 0100 einzubauen
*Install isolation monitor according to VDE 0100, if brigde is removed

	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Hauptstromkreis
main circuit

Projektbez.: UO–D 600–2000 (CD)

Auftragsnr.

Zeichnungsnr.: 545802–01001

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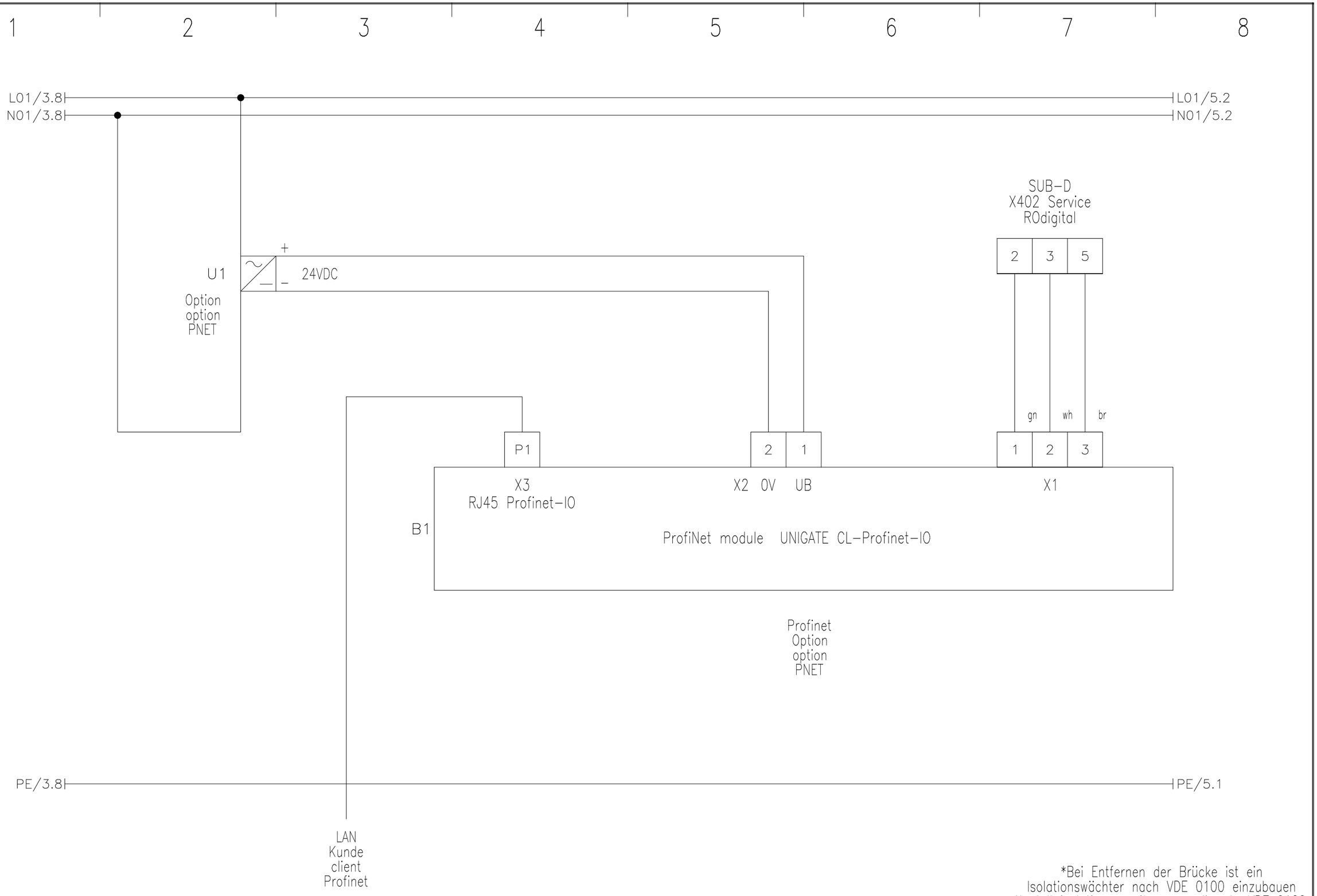

*Bei Entfernen der Brücke ist ein Isolationswächter nach VDE 0100 einzubauen
*Install isolation monitor according to VDE 0100, if brigde is removed

	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Profinet

Projektbez.
UO-D 600-2000 (CD)

Auftragsnr.

Zeichnungsnr.
545802-01001

Blatt 4
Bl. 12

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1 2 3 4 5 6 7 8

RO_DIGI_OUT

Ausgänge outputs

max. zul. Last 1000VA max. allowed load 1000VA

Ausgänge potentialbehaftet outputs with potential

Ausgänge potentialfrei outputs potential-free

Aktiv sobald eine Störung vorliegt Active if fault exists

aktiver Analog ausgang active analog output 4-20mA

Meßzelle Permeat measuring cell permeate

Netz Power in				Pumpe pump P1			Zulaufventil feed valve MV01			Permeatventil permeate valve MV02			Konzentratventil concentrate valve MV03			Sammelstör-meldung collective fault alarm FAULT			Universal ausgang universal output UNI DO			aktiver Analog ausgang active analog output 4-20mA AO		aktiver Analog ausgang active analog output 4-20mA A1		Meßzelle Permeat measuring cell permeate COND		
PE	PE	N	L	PE	N1	230VAC L1	PE	GND	24VDC NO	PE	GND	24VDC NO	PE	GND	24VDC NO	NO	COM	NC	NO	COM	NC	GND	OUT	GND	OUT	GND	A	B
1	1	2	3	4	5	6	13	14	15	16	17	18	19	20	21	7	8	9	10	11	12	61	62	63	64	58	59	60

X9 1 2 3 4 5 6 7 8 9 10

W16-1Q02 BN WH

1Q02
0-1000 uS/cm

K1 A1 A2

X3 N01 1 — W9-1V14 BU BN GN/YE PE — 1V14 1 PE 2

X5 N20 9 — W10-1V01 BU BN GN/YE PE — 1V01 1 PE 2

X5 N20 10 — W11-1V02 BU BN GN/YE PE — 1V02 1 PE 2

X5 N20 11 — W12-1V03 BU BN GN/YE PE — 1V03 1 PE 2

Option option VSE

Option option PR

Option option KSE

PE/4.8 N01/4.8 L01/4.8

1 2 /3.3
3 4 /3.3
5 6 /3.3
13 14 /3.5

	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Anschlußbelegung RO digital
Terminals RO digital

Projektbez.
UO-D 600-2000 (CD)

Auftragsnr.

Zeichnungsnr.
545802-01001

Blatt 5
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1 2 3 4 5 6 7 8

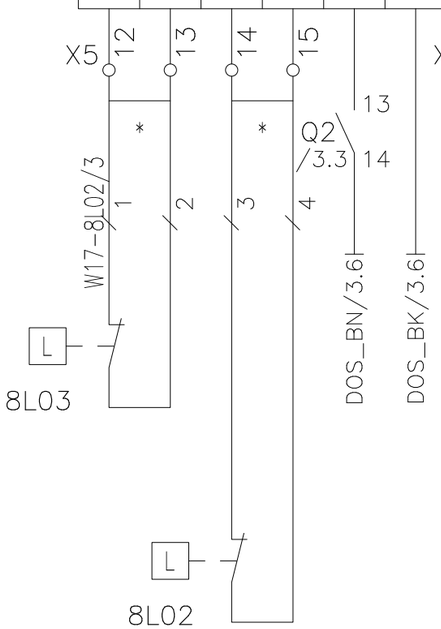
RO_DIG_IN

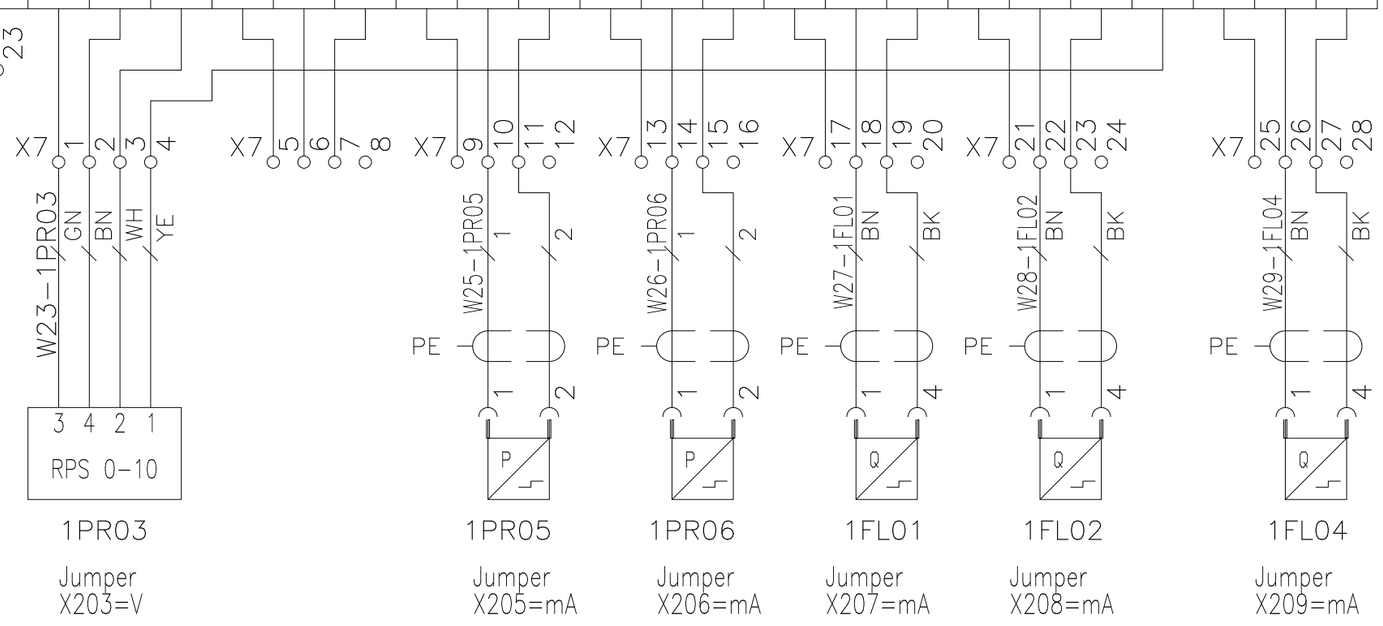
Eingänge inputs

Eingänge potentialbehaftet
inputs with potential

Eingänge potentialbehaftet
inputs with potential

Niveau oben high level	Niveau unten low level	Motorschutz/Hartwasser Motor protect./hard water	Zwangsstop forced stop	Universaleingang universal input	Universaleingang universal input	Universaleingang universal input	Drucksensor pressure sensor Eingang input	Drucksensor pressure sensor Betrieb operation	Durchflußrate flowrate Temperatur temperature Permeat permeate
HL	LL	MOT	STOP	UNI DI1	UNI DI2	UNI DI3	AI1	AI2	AI3	AI4	AI5	AI6/AI7		AI8
IN +24V	IN +24V	IN +24V	IN +24V	IN +24V	IN +24V	IN +24V	GND SUPPLY IN	GND SUPPLY IN	GND SUPPLY IN	GND SUPPLY IN	GND SUPPLY IN	GND SUPPLY IN	IN FLOW	IN TEMP	GND SUPPLY IN
22 23	24 25	26 27	28 29	30 31	32 33	34 35	36 37 38	39 40 41	42 43 44	45 46 47	48 49 50	51 52	53	54	55 56 57





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

	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Anschlußbelegung RO digital
Terminals RO digital

Projektbez.
UO-D 600-2000 (CD)

Auftragsnr.

Zeichnungsnr.
545802-01001

Blatt 6
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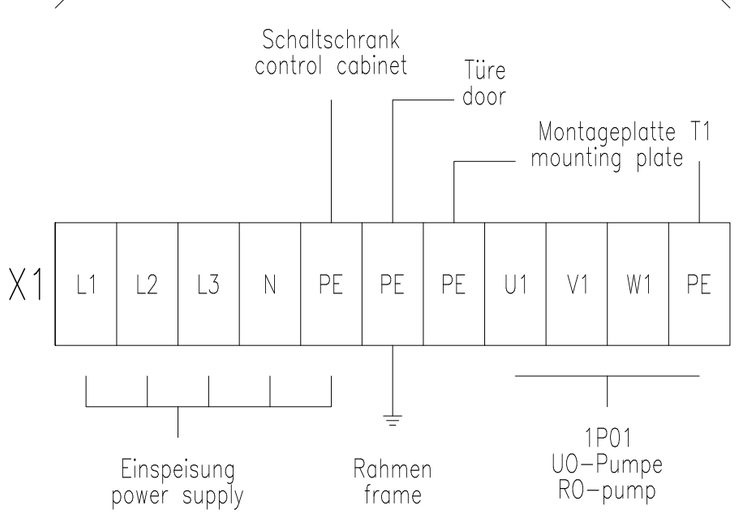
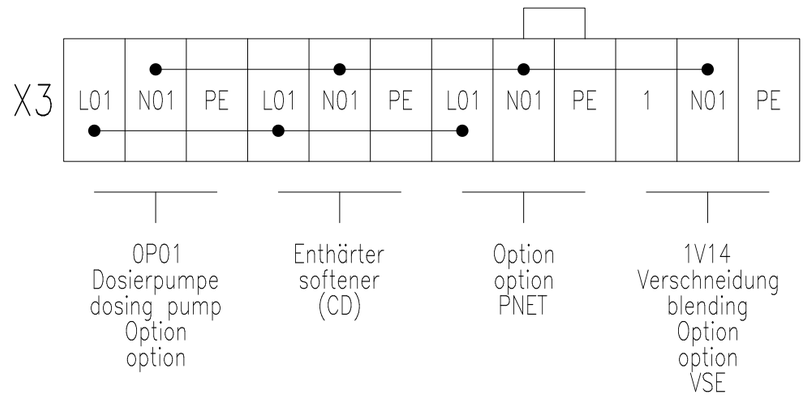
1 2 3 4 5 6 7 8

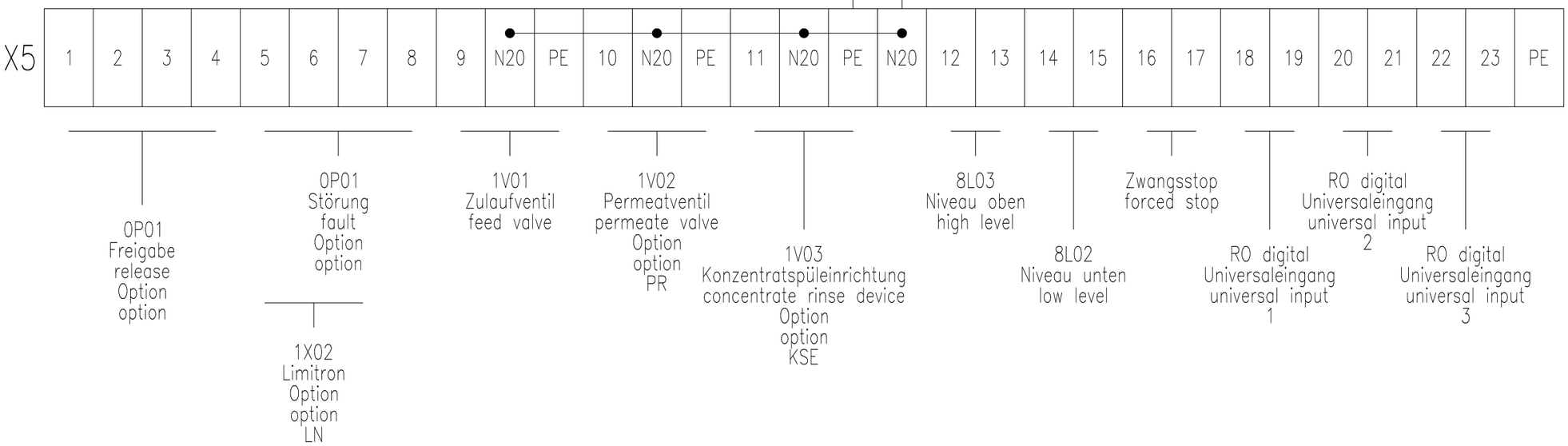
Wago Klemmen
Wago connector 2002



Wago Klemmen
Wago connector 2002



Wago Klemmen
Wago connector 2000



	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

X1, X3, X5

Projektbez.
UO-D 600-2000 (CD)

Auftragsnr.

Zeichnungsnr.
545802-01001

Blatt 7
12 Bl.

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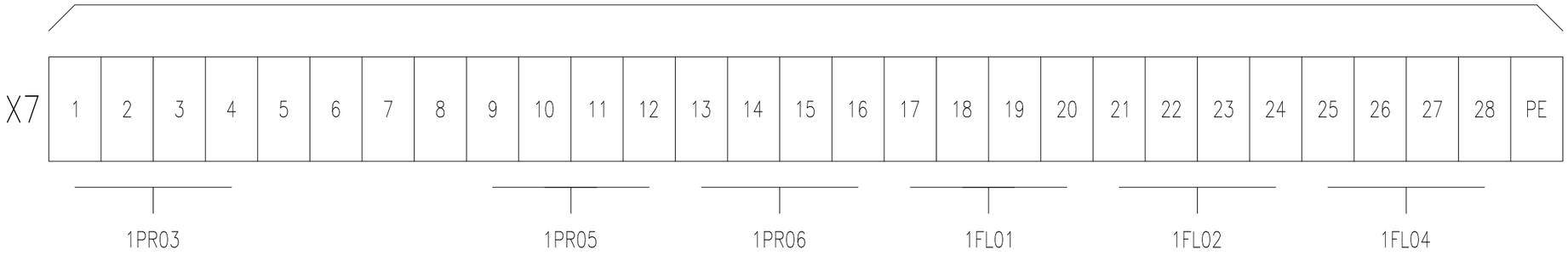
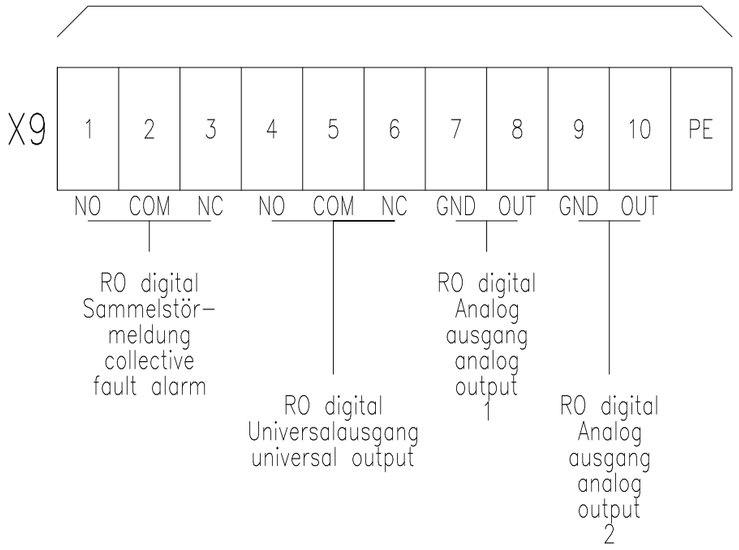
1 2 3 4 5 6 7 8

Wago Klemmen
Wago connector 2000



Wago Klemmen
Wago connector 2000



	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
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c				gepr.	26.06.19	Tie
d						

X7, X9

Projektbez.
UO–D 600–2000 (CD)

Auftragsnr.

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Blatt 8
Bl. 12

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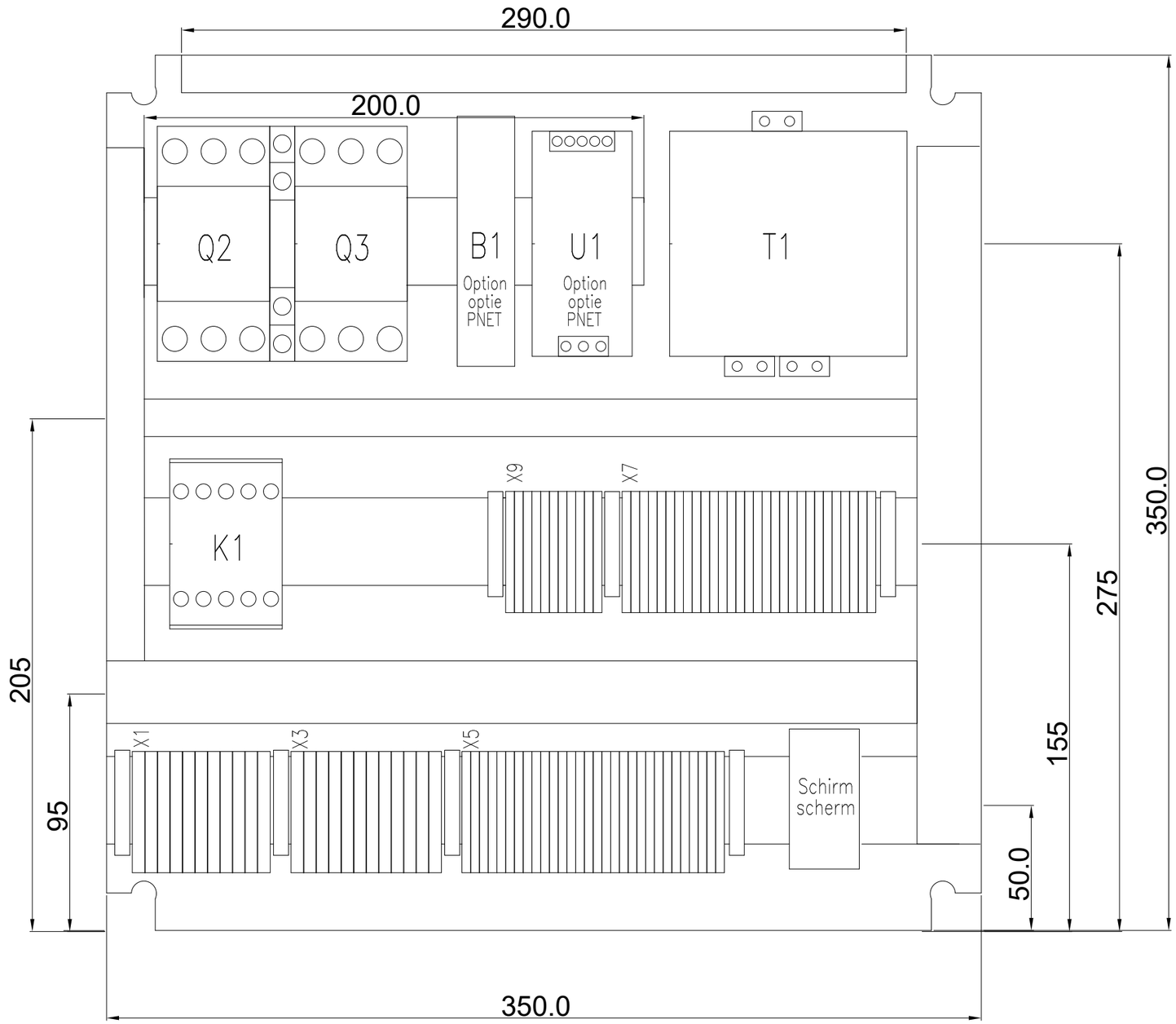

	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Montageplatte
mounting plate

Projektbez.
UO-D 600-2000 (CD)

Auftragsnr.

Zeichnungsnr.
545802-01001

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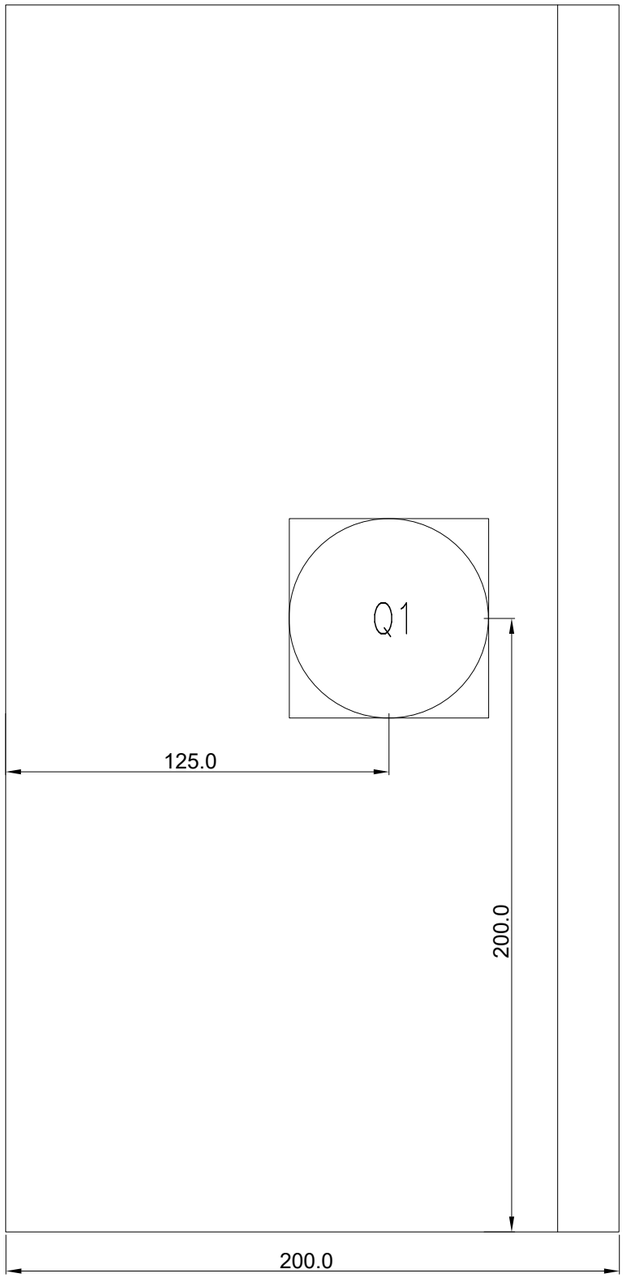

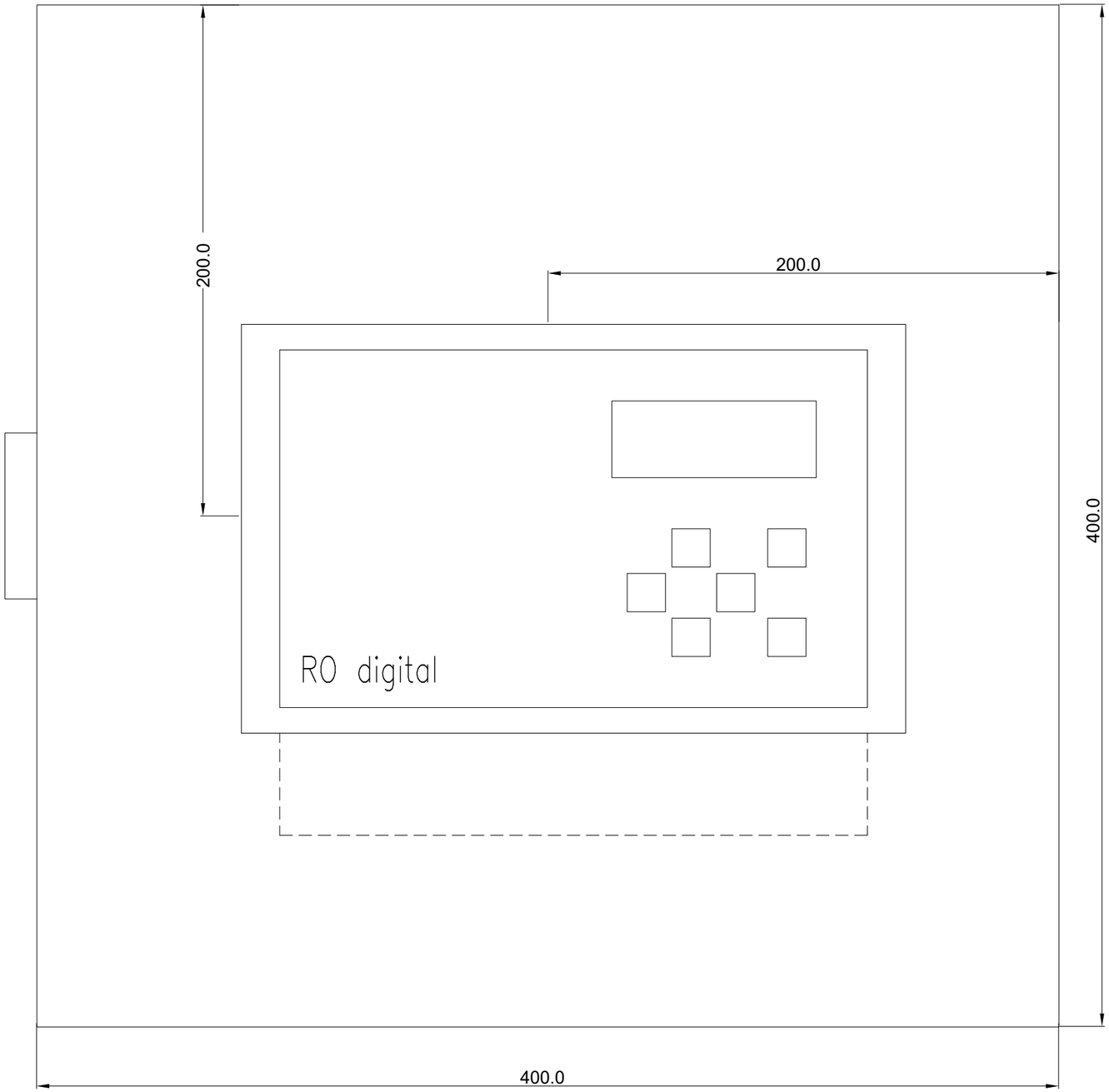

	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Schaltschrank
control cabinet

Projektbez.
UO-D 600-2000 (CD)

Auftragsnr.

Zeichnungsnr.
545802-01001

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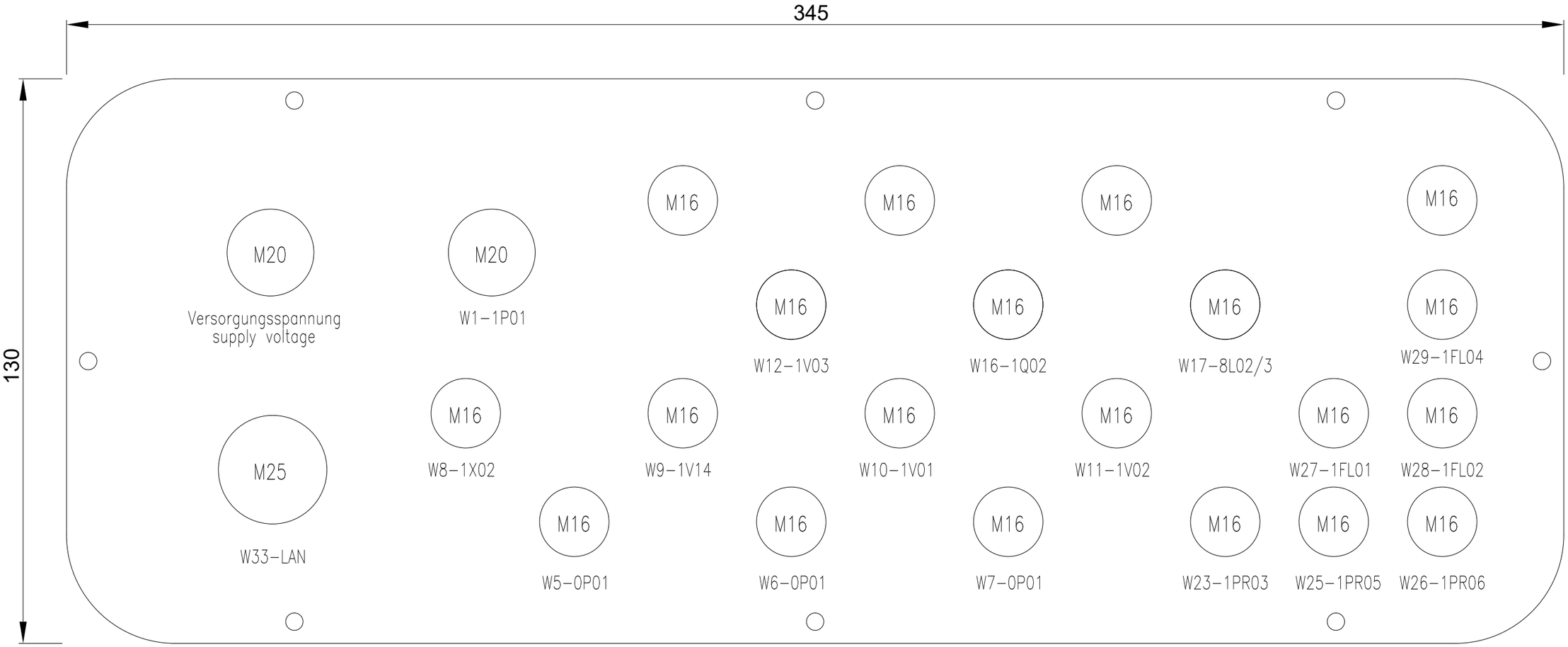
1 2 3 4 5 6 7 8



	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Bodenplatte
base plate

Projektbez.
UO-D 600-2000 (CD)

Auftragsnr.

Zeichnungsnr.
545802-01001

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12 Bl.

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Kabelliste
cable list

Nr. no.	BMK device ID	Typ type	Bel. used	Artikelnummer partnumber	Ziel von Destination from BMK device ID	Ziel nach Destination to BMK device ID
1	W1-1P01	YSLY-JZ 4x1,5	4	00540384	X1	1P01
2	W4-0X02	YSLY-JZ 3x1,5	3	00540383	X3	
3	W5-0P01	YSLY-JZ 3x0,75	3	00540239	X3	0P01
4	W6-0P01	Systemkabel M12-A 4x0,34	1	00453029	X5	0P01
5	W7-0P01	Systemkabel M12-B 4x0,34	1	00453031		
6	W8-1X02	LiYY 3x0,25	3	00540503	0P01	1X02
7	W9-1V14	Gerätestecker Typ A 230V	3	00541238	X3	1V14
8	W10-1V01	Gerätestecker Typ A 24V	3	00541237	X5	1V01
9	W11-1V02	Gerätestecker Typ A 24V	3	00541237	X5	1V02
10	W12-1V03	Gerätestecker Typ A 24V	3	00541237	X5	1V03
11	W16-1Q02	LiYY 2x0,75	2	00540461	RO_DIGI_OUT	1Q02
12	W17-8L02/3	YSLY-JZ 5x0,75	4	00540493	X5	8L03
13	W23-1PR03	Systemkabel VFS/RPS	4	00630522	X7	
14	W25-1PR05	Gerätestecker Typ A 2x0,75	3	00542125	X7	XL
15	W26-1PR06	Gerätestecker Typ A 2x0,75	3	00542125	X7	XL
16	W27-1FL01	Systemkabel M12-A 4x0,34	2	00453029	X7	XL
17	W28-1FL02	Systemkabel M12-A 4x0,34	2	00453029	X7	XL
18	W29-1FL04	Systemkabel M12-A 4x0,34	2	00453029	X7	XL

	Revision	Datum	Name		Datum	Name
a				gez.	26.06.19	Lei
b						
c				gepr.	26.06.19	Tie
d						

Kabelliste
cable list

Projektbez.
UO-D 600-2000 (CD)

Auftragsnr.

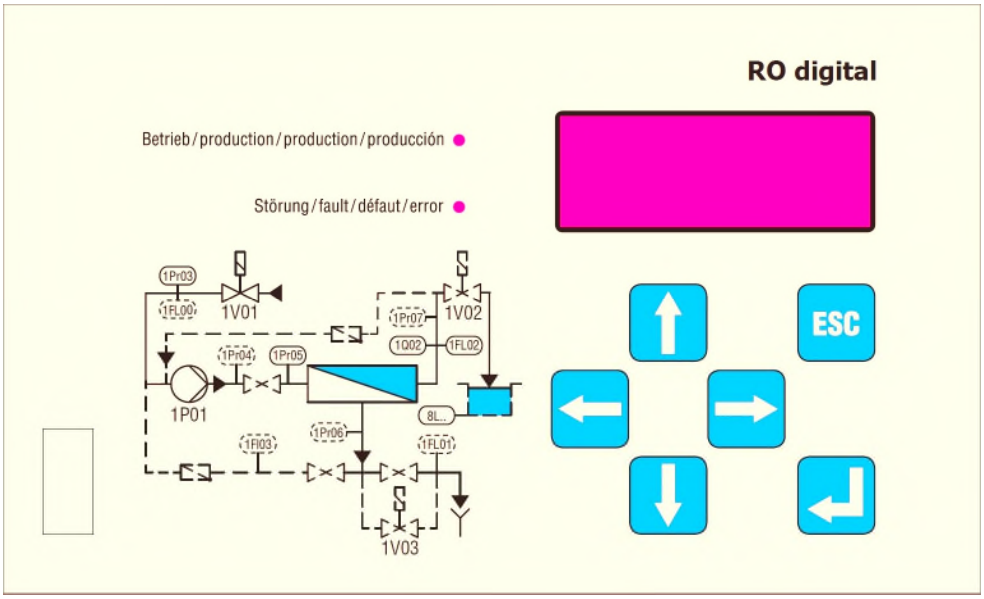
Zeichnungsnr.
545802-01001

Blatt 12
12 Bl.

Operating Instructions

RO digital controller

Software V1.8.x



Translation of the original instructions

Contents

1 Introduction 6
1.1 Description 6
1.2 Notational conventions 6
1.3 Intended use 6
2 Identification 7
2.1 Nameplate 7
2.2 Scope of supply 8
2.3 Accessories 8
3 Mounting 9
3.1 Mounting conditions 9
3.2 Fitting the device into the control cabinet 9
3.3 Mounting the device to the wall 11
4 Electrical connection 12
4.1 Wiring at a glance 12
4.2 Terminal layout 12
4.3 Terminal overview 13
4.4 Cable specifications 13
4.5 Fuses 14
5 Commissioning 15
5.1 Setting the analogue inputs 0.5–3.5 V/ 4-20mA 15
5.2 Programming the machine signature 17
5.3 Parametrising the sensors 17
5.4 Setting the operating parameters 17
5.5 Calibrating the conductivity measurement 17
6 Functional description 18
6.1 Operating modes 18
6.2 Operation 19
6.2.1 Operation flow chart 19
6.2.2 Rejection 20
6.2.3 Production 21
6.2.4 Standby 21
6.2.5 Discontinuous rinse 21
6.2.6 Concentrate displacement / rinse 22
6.3 Disinfection 22
6.4 Rinsing 22
6.5 Diagnosis 22
7 Operation 23
7.1 Operation at a glance 23
7.2 Display and control elements 24
7.3 Menu structure 25
7.3.1 Menu items 25
7.3.2 Data editing 26
7.4 Access Authorisation 28
8 Operation of the installation by personnel 29

8.1 Changing the operating mode 29
8.2 Entering day and time 30
8.3 Parametrising the digital output 30
8.4 Parametrisation of digital inputs 32
8.5 Parametrisation of standard inputs 34
8.6 Standard parametrisation of the analogue inputs 35
8.6.1 Connection of 8L00-mA sensor and sensor adjustment 36
8.7 Setting the limit values 38
8.8 Setting the times 39
8.9 Selecting the parameters 40
8.10 Selecting the alarm options 42
8.11 Carrying out a reset 43
8.12 Measuring and calibrating 44
8.13 Diagnostics 45
8.14 Operating log 47
9 Basic settings / parametrisation 48
9.1 P01 Machine Identification Code 48
9.2 List of parameters 50
10 Faults and their elimination 60
10.1 Indication and acknowledgement 60
10.2 Description of and search for faults 61
10.2.1 1Pr03 (Feed pressure low) ▼▼▼; Pressure 1Pr03<P073.1 61
10.2.2 1Pr03 (Feed pressure low) ▼▼▼; Pressure 1Pr03<P073.2 61
10.2.3 1Pr03 (Feed pressure high) ▲▲▲; Pressure 1Pr03>P077 62
10.2.4 Motor protection; Hard water 62
10.2.5 1Q02 (Conduct. Warning) ▲; 1Q02>P172 62
10.2.6 1Q02 (High conductivity) ▲▲▲; 1Q02>P174 63
10.2.7 1T02 (Low temperature) ▼▼▼; 1T02<P163 63
10.2.8 1T02 (High temperature) ▲▲▲; 1T02>P164 63
10.2.9 1Fl00 (Warn. feedwater low) ▼; 1Fl00<P124 63
10.2.10 1Fl00 (Fault feedwater low) ▼▼▼; 1Fl00<P124 63
10.2.11 1Fl00 (Warn. feedwater high) ▲; 1Fl00>P125 63
10.2.12 1Fl00 (Fault feedwater high) ▲▲▲; 1Fl00>P125 64
10.2.13 1Fl01 (Warn. concentr. Low) ▼; 1Fl01<P134 64
10.2.14 1Fl01 (Fault concentr. Low) ▼▼▼; 1Fl01<P134 64
10.2.15 1Fl01 (Warn. concentr. High) ▲; 1Fl01>P135 64
10.2.16 1Fl01 (Fault concentr. High) ▲▲▲; 1Fl01>P135 65
10.2.17 1Fl02 (Warn. permeate low) ▼; 1Fl02<P144 65
10.2.18 1Fl02 (Fault permeate low) ▼▼▼; 1Fl02<P144 65
10.2.19 1Fl02 (Warn. permeate high) ▲; 1Fl02>P145 65
10.2.20 1Fl02 (Fault permeate high) ▲▲▲; 1Fl02>P145 66
10.2.21 1Fl03 (Warn. recirc. Low) ▼; 1Fl03<P154 66
10.2.22 1Fl03 (Fault recirc. Low) ▼▼▼; 1Fl03<P154 66
10.2.23 1Fl03 (Warn. recirc. high) ▲; 1Fl03>P155 66
10.2.24 1Fl03 (Fault recirc. High) ▲▲▲; 1Fl03>P155 67
10.2.25 1Pr01 (Supply pressure high) ▲▲▲; 1Pr01>P063 67
10.2.26 1Pr04 (Pump pressure high) ▲▲▲; 1Pr04>P083 67
10.2.27 1Pr05 (Oper. pressure high) ▲▲▲; 1Pr05>P093 68
10.2.28 1Pr07 (Perm. pressure high) ▲▲▲; 1Pr07>P113 68
10.2.29 8L01 (Low level alarm) ▼▼▼; 8L01<P183 68

10.2.30 8L04 (High level alarm) ▲▲▲; 8L04>P186 68
10.2.31 UNI-Dix; <Text> 68
10.2.32 UBatt ▼▼▼ 68
10.2.33 Real-time clock error 68
10.2.34 Watchdog error 69
10.2.35 KeyPad Error 69
10.3 Replacing the buffer battery 69
10.3.1 Top mount controller 69
10.3.2 Built-in controller 70
11 Technical data 72
12 Disposal 73

Revision	Date	Author	Comments / Software versions
1	15.08.11	Jm	First version
2	03.09.13	Bvt	amendment of profinet equipment
3	21.10.13	Bvt	update delay fault relay, extension AI
4	31.01.14	Bvt	5. amendment Note AO
5	23.09.14	Bvt	p.13 update AI1-8
6	09.09.15	Bvt	Update pt. 2.3, 9.2, 11
7	03.05.16	Bvt	Update pt. 8.13
8	14.12.18	Bvt	SW version 1.7.0; Impr., 7., 7.1, 7.4, 10.2, 11.
9	23.07.19	Bvt	Insertion pt. 8.6.1
10	07.01.20	Bvt	SW version 1.8.0; pt. 2.1, 2.3, 8.8, 9.2 parameter P30
11	17.05.22	Rei	Update 6.2.2

Imprint

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1 Introduction

1.1 Description

The RO digital controller is used for the fully automatic control of reverse osmosis installations.

1.2 Notational conventions

The following abbreviations are used throughout this manual:

Lim Limit

Cd Conductivity

T Temperature

t Time/Duration

high Output or input actuated

low Output or input not actuated

The following notations are used throughout this manual:

Type:	**Font:**	**Example:**
Keys:	capitals + bold	**LEFT, UP, DOWN**
LEDs:	capitals + bold	**PRODUCTION, FAULT**
Inputs/outputs, inlets/outlets:	capitals + bold	**INLET VALVE**
Operating parameters:	italics	*Cond permeate, flow rate*
Operating status:	capitals + underlined	OFF, OPERATION
Operating modes:	capitals + underlined	REJECT, PERMEATE RECIRCULATION
Faults:	capitals + underlined	LACK OF PRESSURE

1.3 Intended use

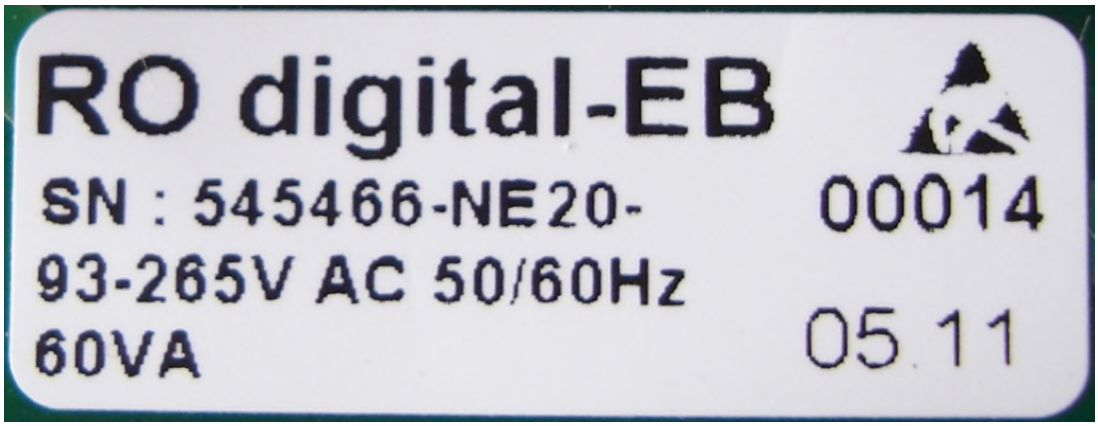
This controller is intended to control reverse osmosis installations in non-explosion-prone areas.

- The device can be mounted on top of an installation (top-mount casing) or fitted into an installation (fitted casing). Another mounting type is not permitted.
- The manufacturer is not liable for damages resulting from improper or unintended use. Improper or unintended use may turn the controller into a hazardous device.

2 Identification

2.1 Nameplate

The nameplate is located on the I/O board near the power input.



EB: RO digital with fitted casing

AB: RO digital with top-mount casing

2.2 Scope of supply

- Unit with terminal block
- Terminal diagram (printed onto the board)
- Bill of materials

2.3 Accessories

We offer the following optional accessories for the controller:

- Item no. 100066: Measurement cell 1/4 inch; 1-1000 µS/cm; cable length 1.5 m
- Item no. 100067: Measurement cell 1/4 inch; 1-1000 µS/cm; cable length 6 m
- Item no. 383423: Standard front foil in 4 languages, coloured, for top-mount casing with PID
- Item no. 383731: Standard front foil in 4 languages, coloured, for fitted casing with PID
- Item no. 383732: Standard front foil in 4 languages, coloured, for fitted casing without PID
- Item no. 541842: Profinet-module for RO digital for fitted casing
- Item no. 542070: Profinet-module for RO digital for top-mount casing
- Item no. 542181: Profibus-module for RO digital for fitted casing

3 Mounting

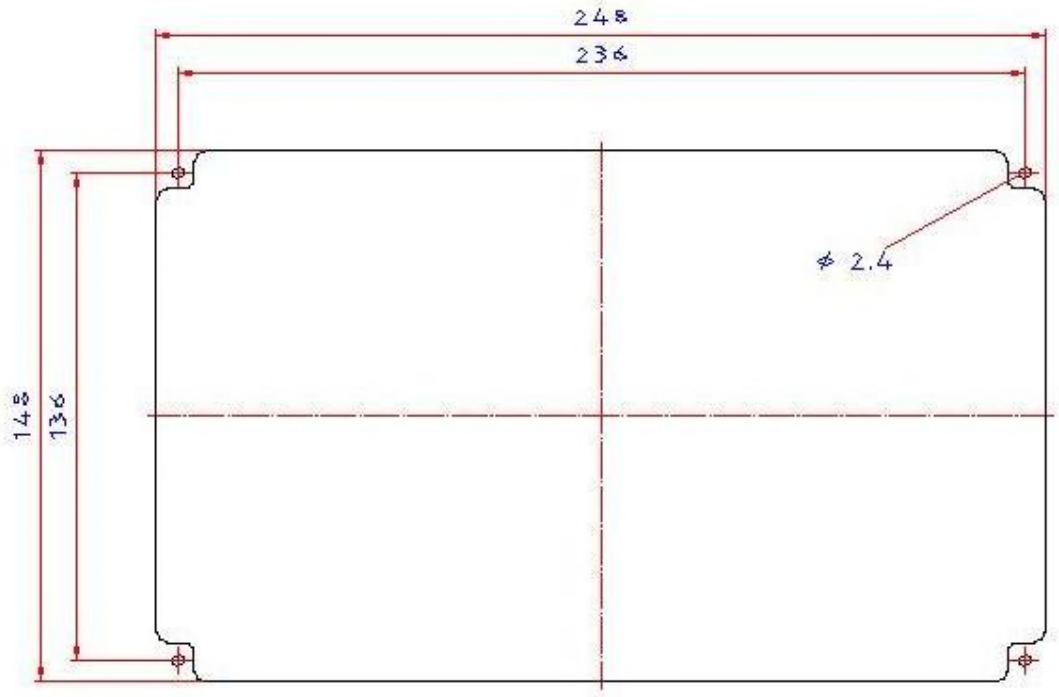
3.1 Mounting conditions

Working temperature range: 0 to 45°C (32 to 113°F), relative humidity 10 to 90%, non-condensing.

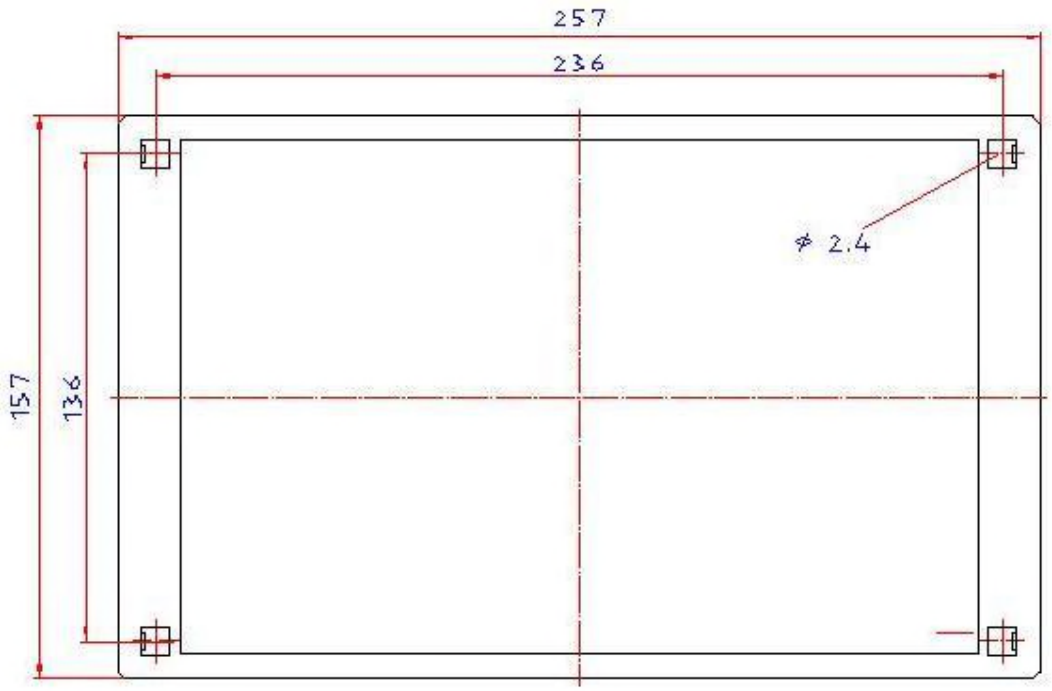
Note:

- Please provide sufficient cooling of the installation in order to avoid heat accumulation.
- Make sure there is sufficient distance to strong magnetic fields.

3.2 Fitting the device into the control cabinet



- Make an opening as shown in the drawing.
- Cut mounting holes for M3 screws.
- Slide on gaskets included in the delivery.
- Insert the control into the opening from the front side.

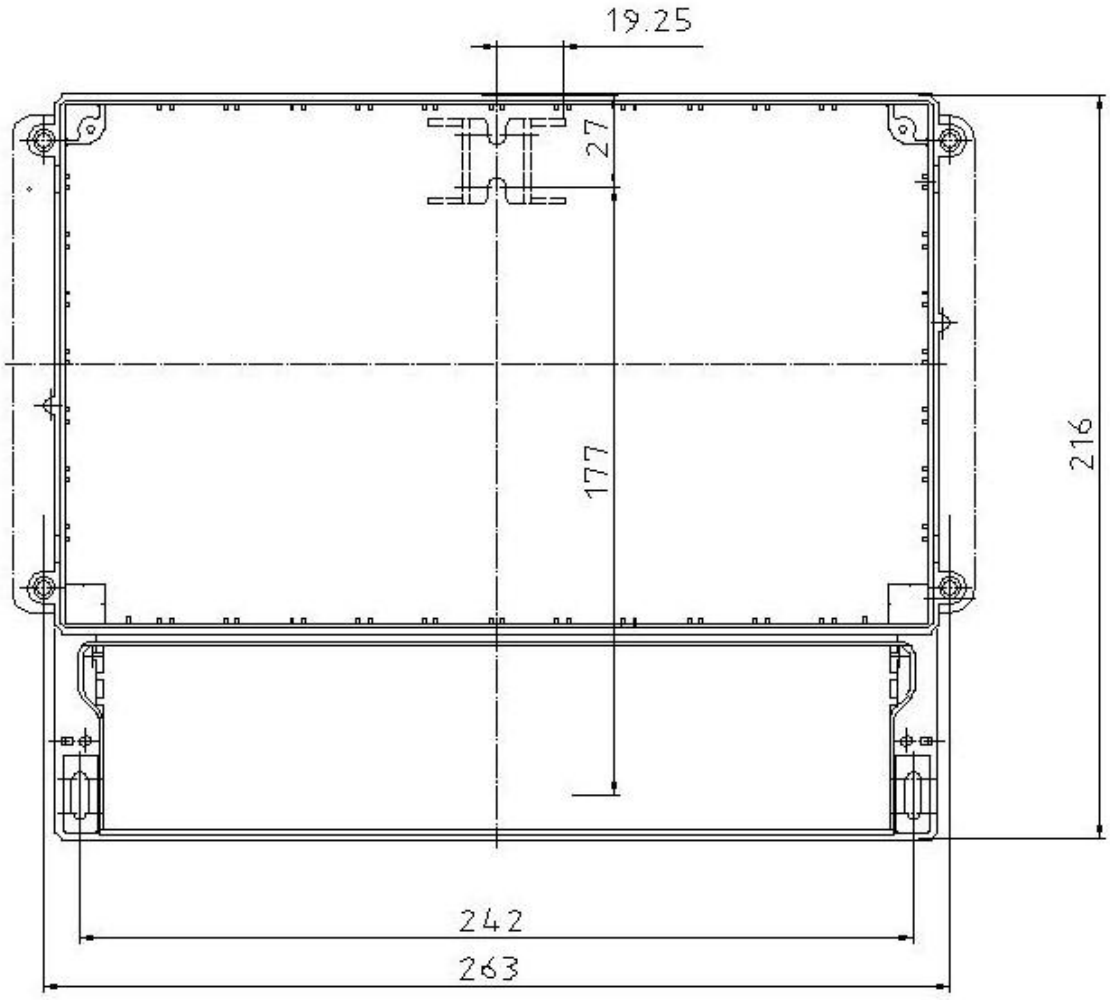


- Secure the control with 4 M3 x 20mm screws.

Note:

IP65 protection is only guaranteed if the device is mounted into a control cabinet.

3.3 Mounting the device to the wall



- Drill 3 holes (diameter and dowel type depend on wall structure) as shown in the drawing.
- Unscrew the device's terminal block cover.
- Insert the top screw in the middle.
- Position the device onto that screw.
- Attach the device with both screws.
- Screw the terminal block cover back on.

4 Electrical connection

4.1 Wiring at a glance

Warning!

Note that the entire electric connection may only be carried out while the device is disconnected from the mains.

Note:

- The protective earth connection must be carried out before any other connection. Danger may occur if the PE wire is interrupted.
- Before performing the start-up, make sure that the supply voltage corresponds to the value indicated on the nameplate (right side or back side of casing).
- Combining low safety voltage and voltage presenting a risk of electrocution at the relays is not permitted.
- For the mains line, an overcurrent protection device (nominal current ≤ 16 A) is required.

Note:

Observe the terminal diagram printed on the board.

4.2 Terminal layout

Terminal	Function	Type	Printing	Comment
	Rack earthing lug	PE		
1	Supply voltage	PE	POWER IN	Internal fuse: 6.3 A
2		230V neutral		
3		230V phase		
4	Pump 1P01	PE	P1	Actual voltage corresponds to supply voltage
5		230V neutral, NO contact		
6		230V phase, NO contact		
7	Centralised alarm	NO	FAULT	Voltage-free contact Max. 250 VAC/4A; 24 VDC/1A
8		COM		
9		NC		
10	Universal output	NO	UNI DO	Voltage-free contact Max. 250 VAC/4A; 24 VDC/1A
11		COM		
12		NC		
13	Feed valve 1V01	PE	MV01	24VDC; max. 0.5 A
14		GND		
15		24VDC NO contact		
16	Permeate valve 1V02	PE	MV02	24VDC; max. 0.5 A
17		GND		
18		24VDC NO contact		
19	Concentrate valve 1V03	PE	MV03	24VDC; max. 0.5 A
20		GND		
21		24VDC NO contact		
22	Upper level 8L03	+ input	HL	For voltage-free, external switch
23		+ 24 VDC		
24	Lower level 8L02	+ input	LL	For voltage-free, external switch
25		+ 24 VDC		

Terminal	Function	Type		Comment
26	Motor protection/hard water	+ input	MOT	For voltage-free, external switch
27		+ 24 VDC		
28	Forced stop	+ input	Stop	For voltage-free, external switch
29		+ 24 VDC		
30	Universal input 1	+ input	UNI DE 1	For voltage-free, external switch
31		+ 24 VDC		
32	Universal input 2	+ input	UNI DE 2	For voltage-free, external switch
33		+ 24 VDC		
34	Universal input 3	+ input	UNI DE 3	For voltage-free, external switch
35		+ 24 VDC		
36	Pressure probe supply pressure 1Pr03	GND	AI 1	Sensor supply/ Signal input: choice of either 5 VDC/ 0.5–3.5 V or 24 VDC/ 4–20mA via jumper x 203
37		Sensor supply		
38		Signal input		
39	Analogue input2	GND	AI 2	Sensor supply/ Signal input: choice of either 5 VDC/ 0.5–3.5 V or 24 VDC/ 4–20mA via jumper x 204
40		Sensor supply		
41		Signal input		
42	Analogue input3	GND	AI 3	Sensor supply/ Signal input: choice of either 5 VDC/ 0.5–3.5 V or 24 VDC/ 4–20mA via jumper x 205
43		Sensor supply		
44		Signal input		
45	Analogue input4	GND	AI 4	Sensor supply/ Signal input: choice of either 5 VDC/ 0.5–3.5 V or 24 VDC/ 4–20mA via jumper x 206
46		Sensor supply		
47		Signal input		
48	Analogue input5	GND	AI 5	Sensor supply/ Signal input: choice of either 5 VDC/ 0.5–3.5 V or 24 VDC/ 4–20mA via jumper x 207
49		Sensor supply		
50		Signal input		
51	Permeate flow / temperature sensor 1FI02 / 1T02	GND	AI 6/7	Sensor supply/ Signal input: choice of either 5 VDC/ 0.5–3.5 V or 24 VDC/ 4–20mA via jumper x 208
52		Sensor supply		
53		Flow signal input		
54		Temperature signal input		Input 0,.5-3.5V
55	Analogue input 8	GND	AI 8	Sensor supply/ Signal input: choice of either 5 VDC/ 0.5–3.5 V or 24 VDC/ 4–20mA via jumper x 209
56		Sensor supply		
57		Signal input		
58	Permeate conductivity sensor / 1Q02	Shield (ground)	COND	
59		Cond. Sensor A		
60		Cond. Sensor B		
61	Analogue Output1 4-20mA	-	A0	Max. load: 500 Ohm
62		+		
63	Analogue Output2 4-20mA	-	A1	Max. load: 500 Ohm
64		+		

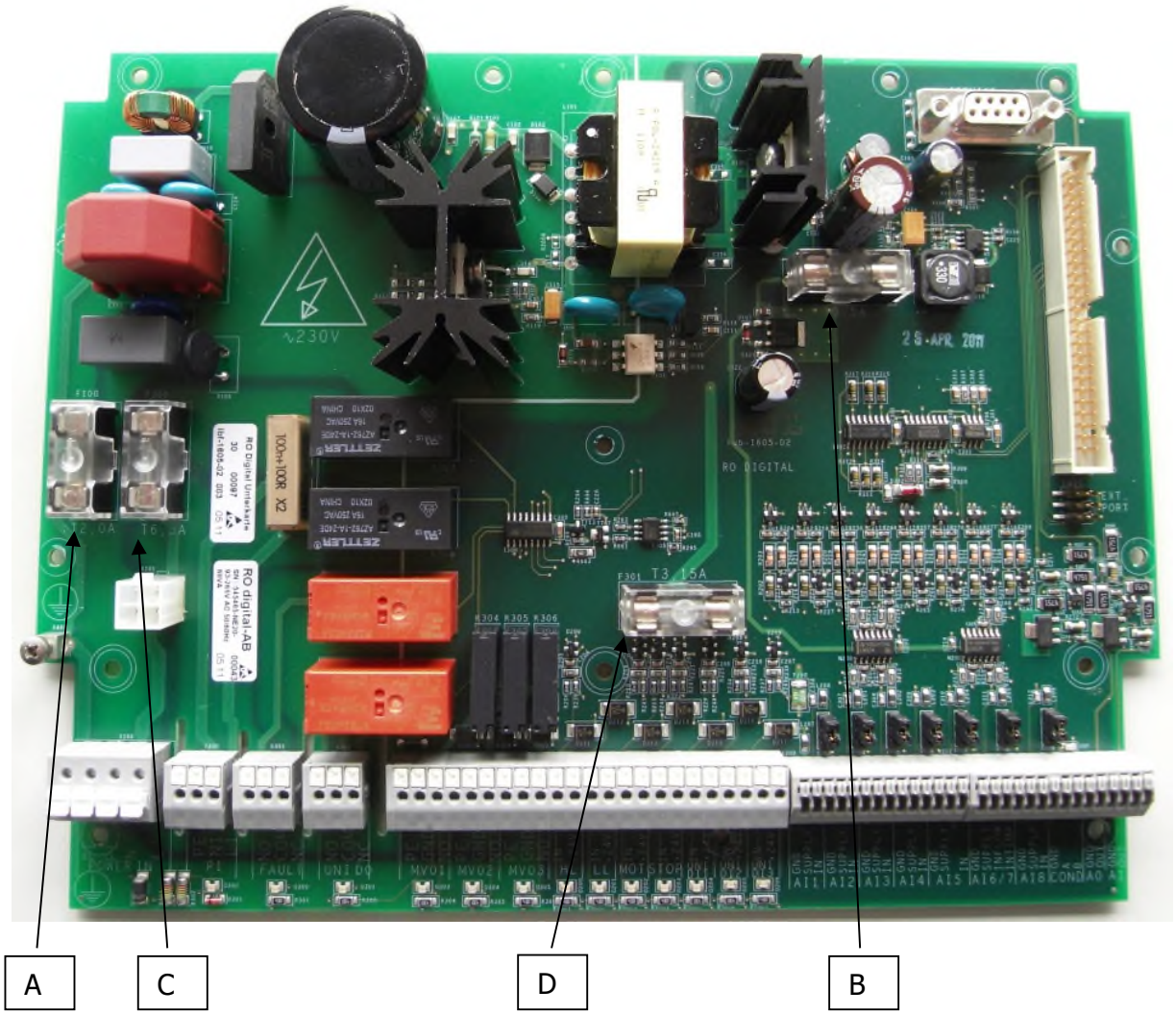
4.3 Terminal overview

Terminal	Max. cross-section	Max. current	Remarks
1 to 3	2.5 mm²	16A	Supply voltage
4 to 35	1.5 mm²	10A	Pump, digital outputs, digital inputs
36 to 62	0.5 mm²	2A	Sensor supply, analogue inputs, conductivity sensor, analogue output

4.4 Cable specifications

Terminals	Cable min.	Cable max.	Cable type
Supply voltage	3 x 1.5 mm²	3 x 2.5 mm²	NYM-J/ÖLFLEX® 110

4.5 Fuses



	Designation	Value	Function
A	F100	2 AT	Fuse mains input
B	F101	0.5 AT	Fuse electronics
C	F300	6.3 AT	Fuse pump output
D	F301	3.15 AT	Fuse digital outputs

5 Commissioning

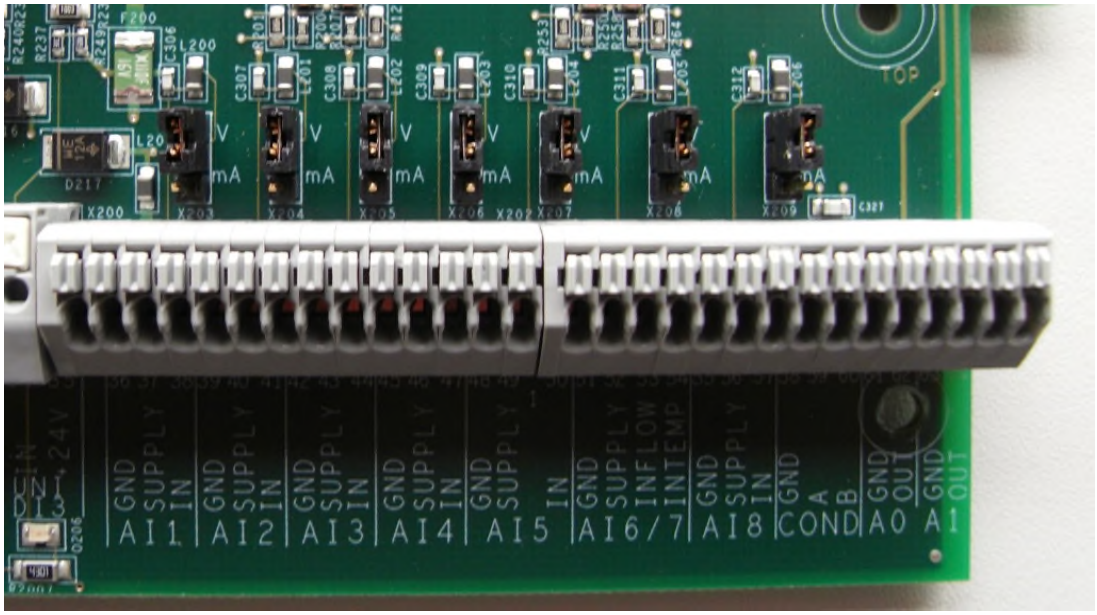
Note:

Before first start-up make sure that jumpers are set correctly. Wrongly set jumpers can damage analogue outputs and connected sensors.

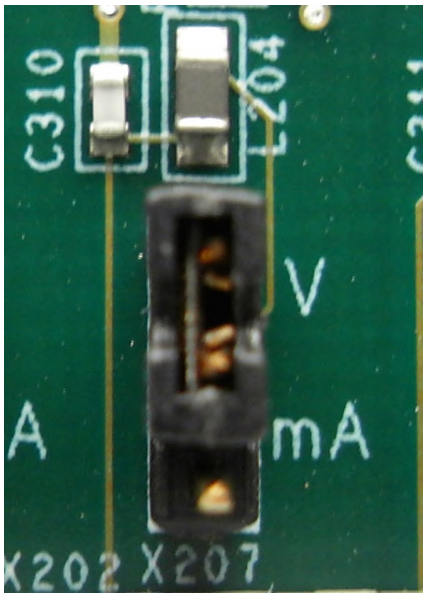
Note:

Active analogue output; do not connect power (24V DC) on the 4-20 mA analogue outputs.

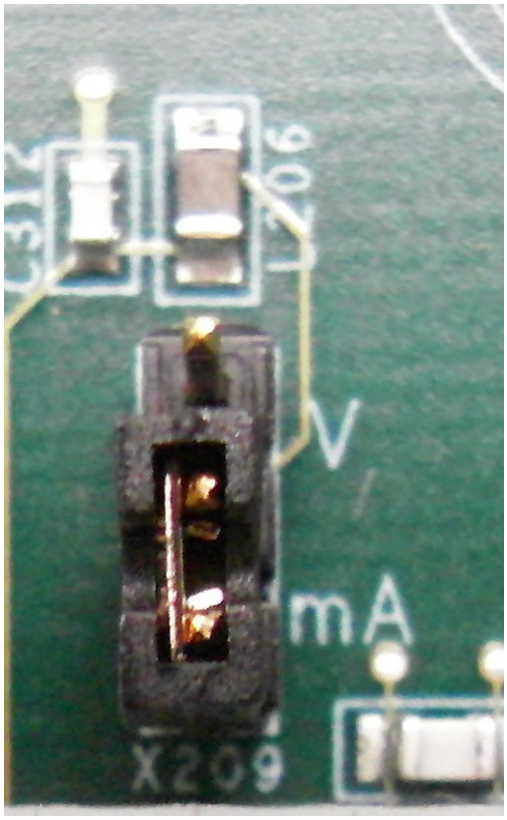
5.1 Setting the analogue inputs 0.5–3.5 V/ 4-20mA



Set by a jumper above the input terminals.



Analogue sensor 0.5–3.5 V/ sensor supply 5 VDC



Analogue sensor 4 20 mA/ sensor supply 24 VDC

5.2 Programming the machine signature

See chapter 9.1 P01 Machine identification code

5.3 Parametrising the sensors

See chapter 8.12 Measuring and calibrating

5.4 Setting the operating parameters

See chapters: 8.7 Setting the limit values, 8.8 Setting the times, and 8.9 Selecting the parameters.

5.5 Calibrating the conductivity measurement

See chapter 8.12 Measuring and calibrating

6 Functional description

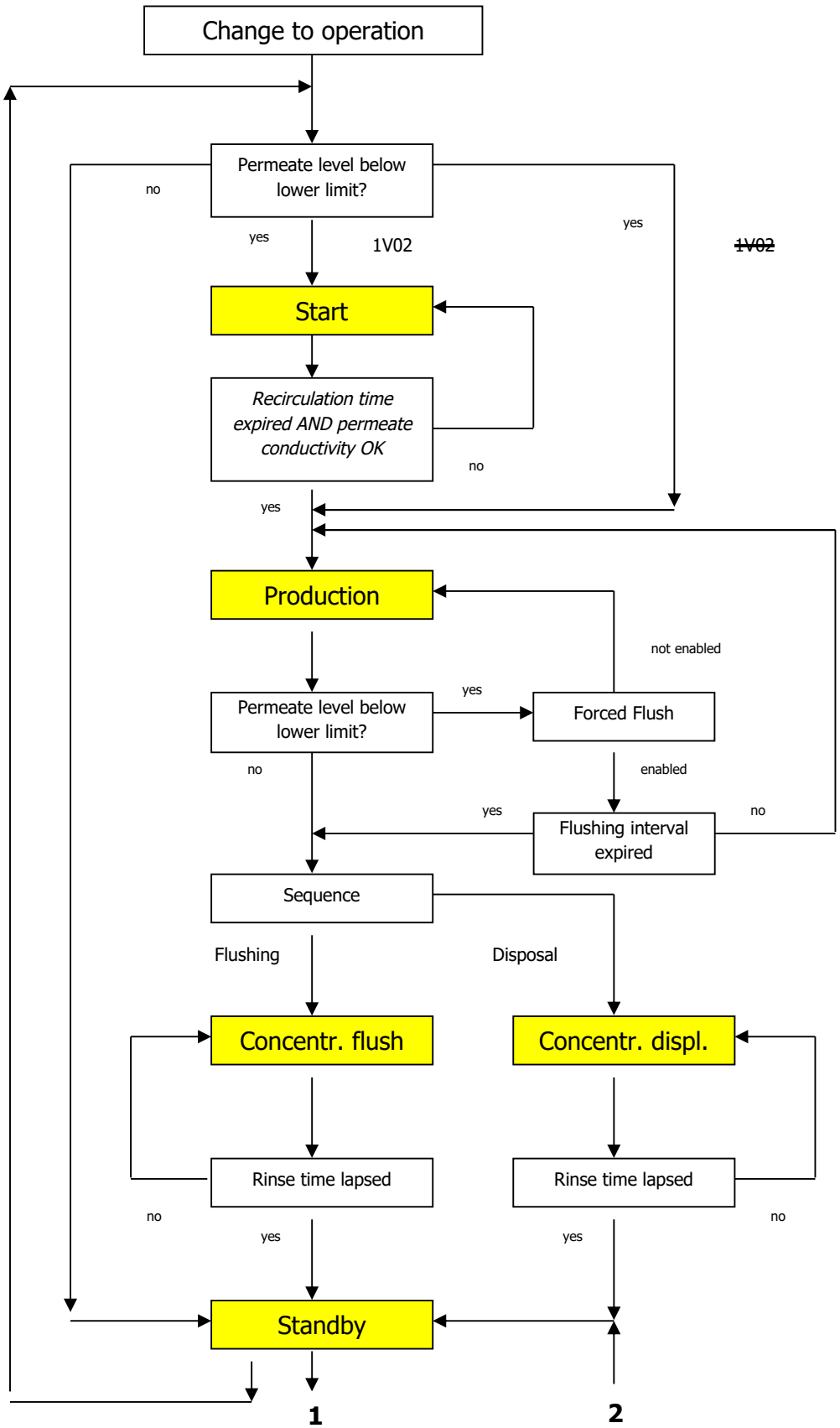
6.1 Operating modes

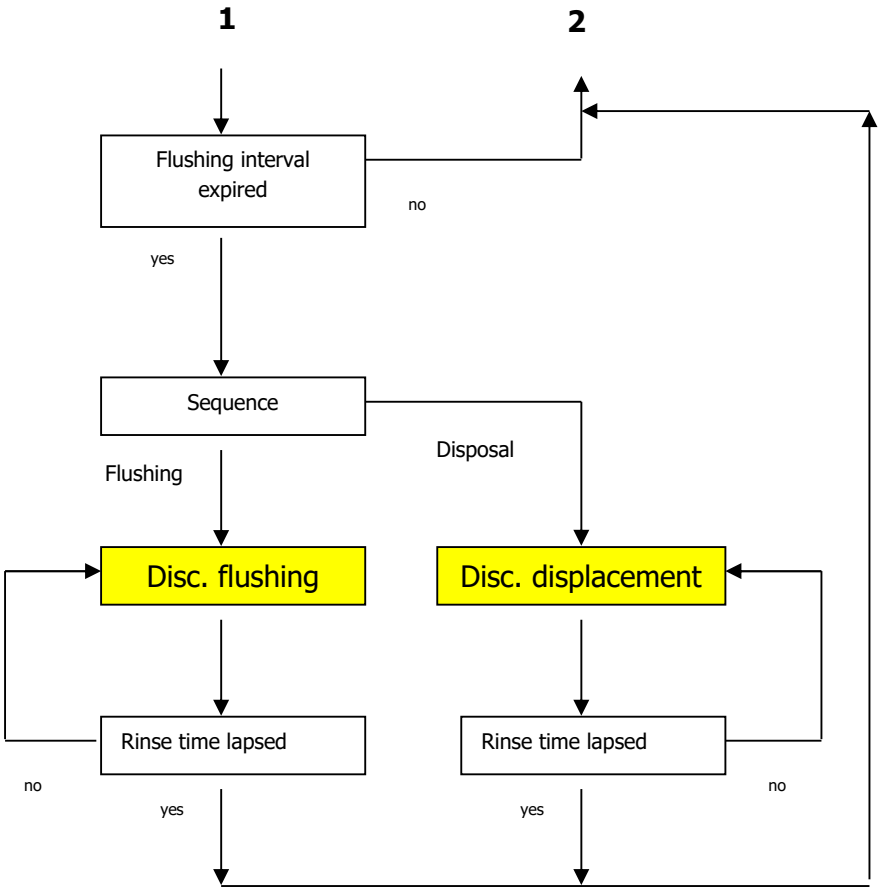
The RO digital can be set to the following operating states:

- OFF
- OPERATION
- DISINFECTION
- RINSING
- DIAGNOSIS

6.2 Operation

6.2.1 Operation flow chart





6.2.2 Rejection

During the START phase, permeate is recycled or sent to the drain, depending on the installation configuration. Permeate is recycled until its conductivity has fallen below the limit (parameter 174). For the START phase, a minimum duration (parameter 050) as well as a maximum duration (parameter 051) have been defined.

During the START phase, the **VALVE** 1V01 is open and the **PUMP** 1P01 is running. The **PERMEATE VALVE** (Option) 1V02 remains closed.

The installation does not produce permeate.

6.2.3 Production

During the PRODUCTION phase, permeate is produced until the tank is full (**LEVEL** 8L03).

The display indicates the following messages alternately:

- Production: Operating hours; Conductivity 1Q02; Temperature 1T02
- Flow rates
- Pressure values
- States of the digital outputs
- Totalised flow rate and yield

During this operating phase, the **PUMP** 1P01 is running and the **VALVES** 1V01 and 1V02 are open.

The installation produces permeate.

6.2.4 Standby

During PRODUCTION the permeate tank is filled until the Tank Full message is triggered. If the full level is reached, the installation changes to STANDBY. If additional filling is required by the **LEVEL** switch, the installation returns to PRODUCTION.

During this state, **PUMP** 1P01 is not running and the **VALVES** 1V01 and 1V02 are closed.

No permeate is produced.

6.2.5 Discontinuous rinse

If the installation remains in STANDBY for a certain, settable time (parameter 042), DISC. FLUSHING is carried out for a settable time (parameter 041). If the parameter 042 is set to zero, the DISC. FLUSHING is switched off.

During this state, the **PUMP** 1P01 is running, the **VALVE** 1V01 is open and the **VALVE** 1V02 is either closed ("*Tank without overflow*") or open ("*Tank with overflow*"), depending on parameter 280.

6.2.6 Concentrate displacement / rinse

If, during PRODUCTION the upper **LEVEL** input is activated, the installation switches to CONCENTRATE DISPOSAL/-FLUSHING for a settable time (parameter 041).

During this operating phase, the **PUMP** 1P01 is running (only during rinse), the **VALVE** 1V01 is open and the **VALVE** 1V02 is closed; if "*Tank with overflow*" is set, the **VALVE** remains open.

6.3 Disinfection

The installation runs **without any safety devices** in order to allow continuous DISINFECTION.

The **VALVES** 1V01 and 1V02 are open; the **PUMP** 1P01 is running.

After DISINFECTION, it must be ensured that the installation is free from any disinfectant.

Note!

When in this operating status, the installation runs without any safety devices.

6.4 Rinsing

The installation runs **without any safety devices** in order to allow flushing of preservatives.

The **VALVES** 1V01 and 1V03 are open.

After FLUSHING, it must be ensured that the installation is free from preservatives.

Note:

When in this operating status, the installation runs without any safety devices.

6.5 Diagnosis

DIAGNOSIS is accessed via the menu. In this operating status, all outputs of the controller can be manipulated via the membrane keyboard and the status of the controller inputs can be shown.

Note:

The units connected to the controller outputs are triggered without any safety devices if the respective output is actuated in diagnosis mode!

7 Operation

In the following chapters images of the visualization of the control system are used to illustrate the operation of the unit. The settings and values shown there are examples and are **not** applicable to an actual unit and its controller and visualization.

Do not use the display languages D-Text und GB-text for the following unit series:

- HP xxx D/E
- HP xxx D/E/B

Adhere to the relevant PID's.

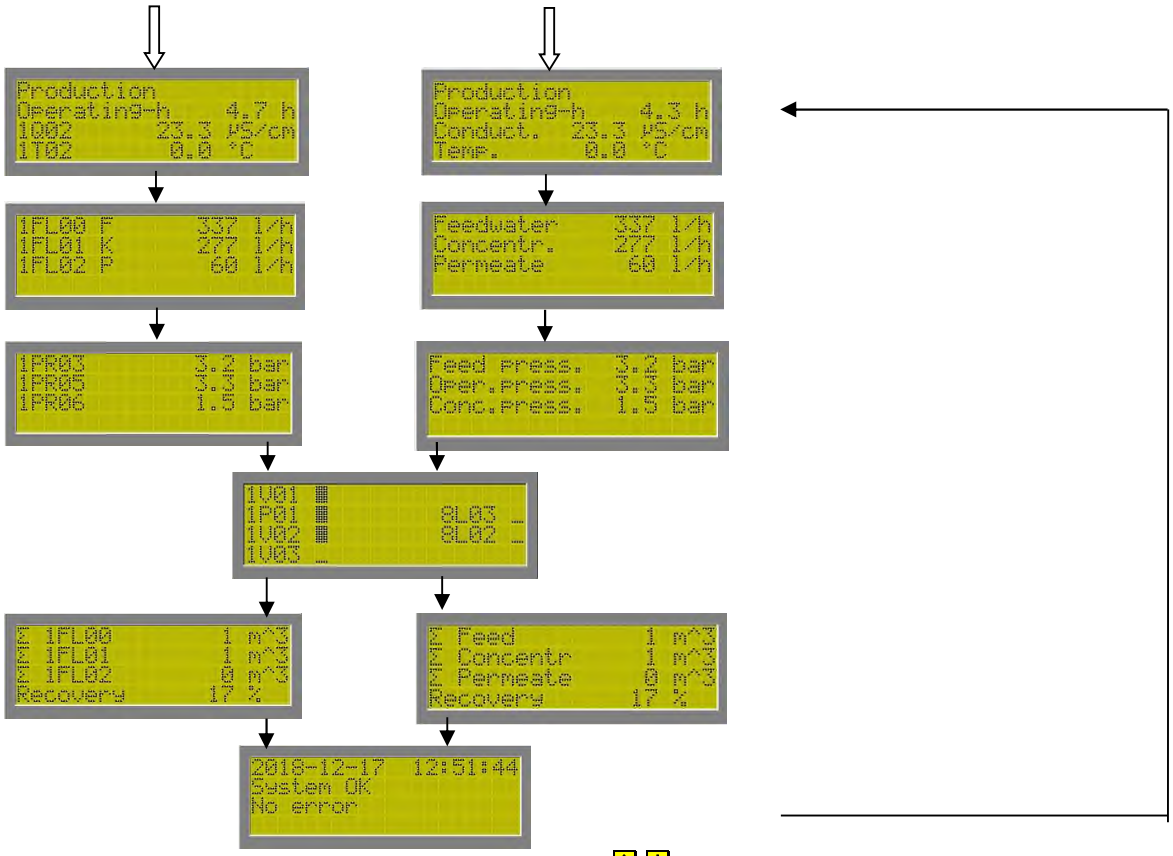
7.1 Operation at a glance

The controller is easy to understand so that commissioning is facilitated.

The integrated process visualisation allows the activated units (pump 1P01; valves 1V01, 1V02, 1V03; pressure switches 1PR03, 1Pr04, 1Pr05, 1Pr06; flow rates 1Fl00, 1Fl01, 1Fl02, 1Fl03) to be displayed on the screen. Inactive units bear a dash (–) or are not shown at all.

Below you will find explanations on the differences of the display languages:

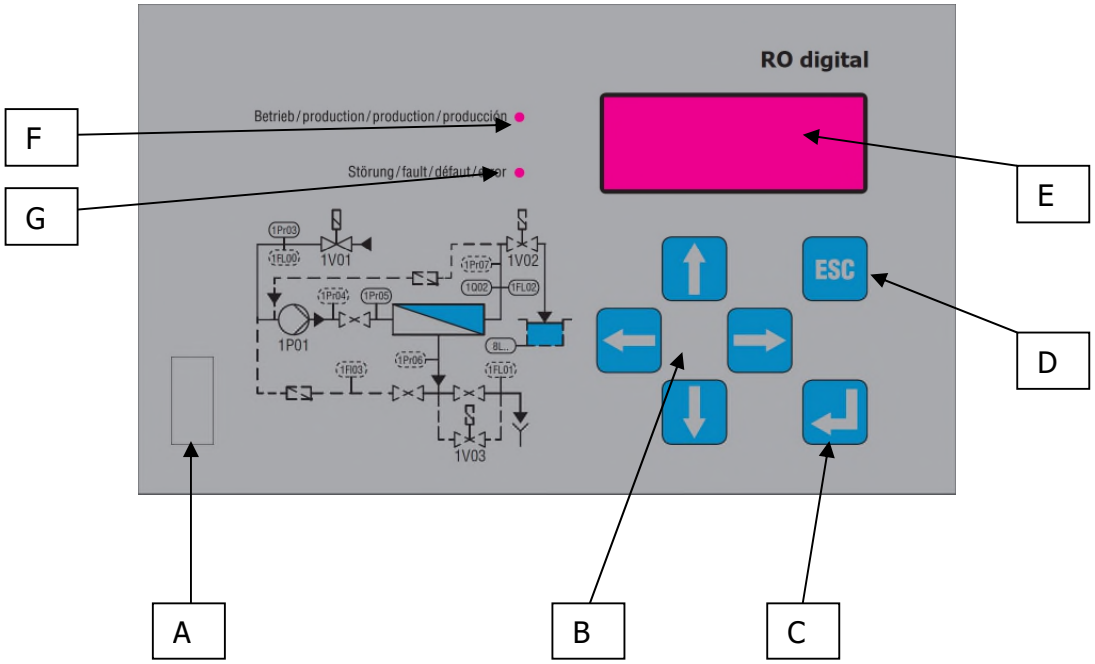
Display language: English Display language: GB-text



Activate and deactivate scrolling with the keys ⇧ ⇩.

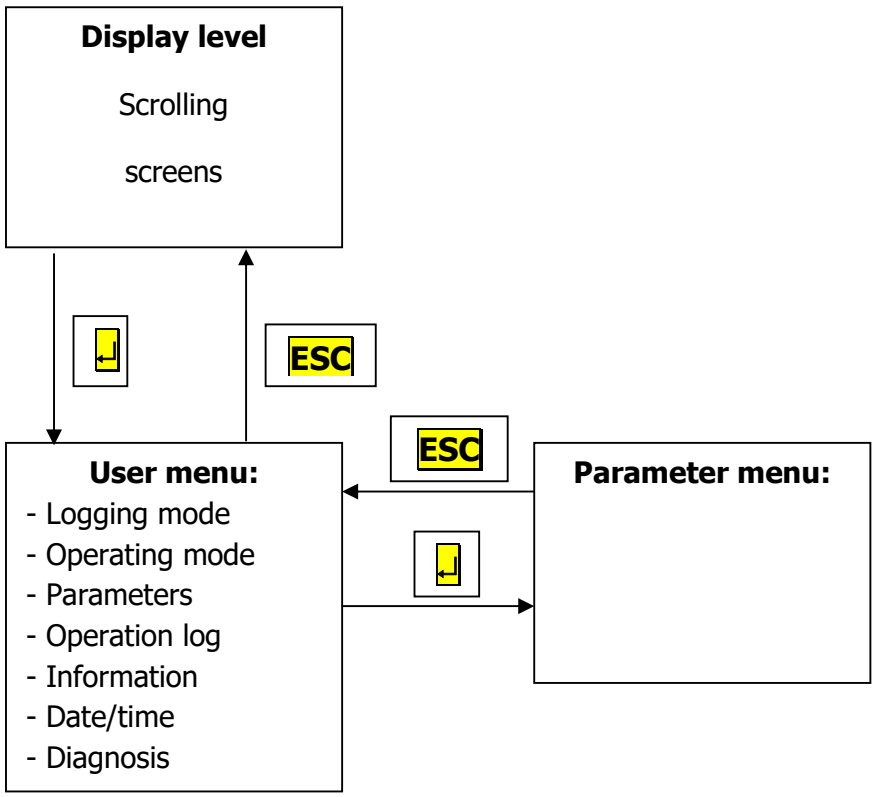
7.2 Display and control elements

The user interface consists of a text display (4x20 characters), 6 keys and an **OPERATION** and a **FAULT** LED. It also has an acoustic alarm.



	Designation	Function
A	Mains switch	- Turn the installation on and off ➔ top-mount housing only
B	← ↑ → ↓	- Password entry - Menu selection - Options
C	↵	- Confirm data entered - Enter the menu
D	**ESC**	- Exit menu - Fault acknowledgement
E	Display	Display of: - current operating mode - permeate conductivity and temperature - operating hours - flow rates - pressure values - switching state of the outputs - current faults
F	LED **PRODUCTION** (green)	Unit is operating
G	LED **FAULT** (red)	Fault active

7.3 Menu structure



7.3.1 Menu items

The menu consists of several items in a list (arranged one below the other) that can be longer than the number of items displayed on the screen.

A menu item is selected with the arrow ▸ on the left side of the screen. The arrow is moved with the ↑ ↓ keys to the menu item of your choice. The marked menu item is then selected with the ↵ key. If the list of menu items is longer than can be displayed on the screen, the controller scrolls automatically.

Note:

- Most of the menus have a hierarchical structure, i.e., upon selection of a menu item, an additional submenu opens.
- You can usually leave a menu by pressing the **ESC** key (return to standard level).

7.3.2 Data editing

Editing is generally carried out via a special screen in which the parameters are displayed.

Any editing process may be aborted without saving the changed value by pressing **ESC**.
When editing parameters, the following data types are to be differentiated:

7.3.2.1 Numerical data

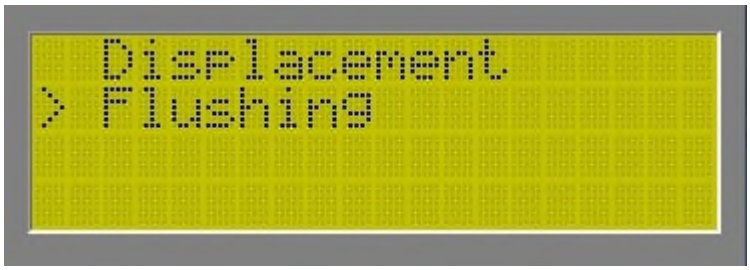
Numerical editing is carried out to adjust the operating parameters and to set the reference parameters. Numerical editing is done in the same way a decade switch is used.

The digit to be changed is selected with the cursor (a block in the display) and set to the desired value by pressing the ↑ ↓ keys as often as necessary. By means of the ← → keys, the cursor can be moved to the other digits so that these can be modified as well.

The value indicated is stored using the ↵ key.

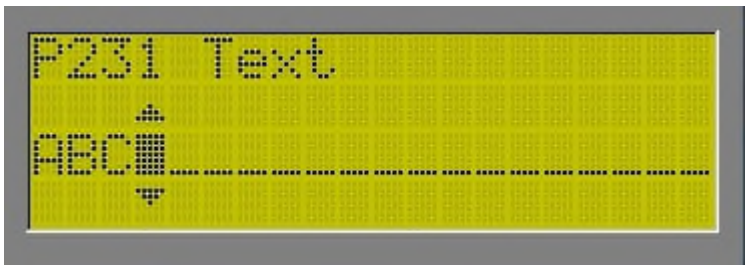
7.3.2.2 Selection data

In some cases an option can be selected (operating statuses, operating modes). Upon access, the operator can scroll through all additional options with the ↑ ↓ keys. The displayed option is confirmed with the ↵ key.



7.3.2.3 Alphanumerical data

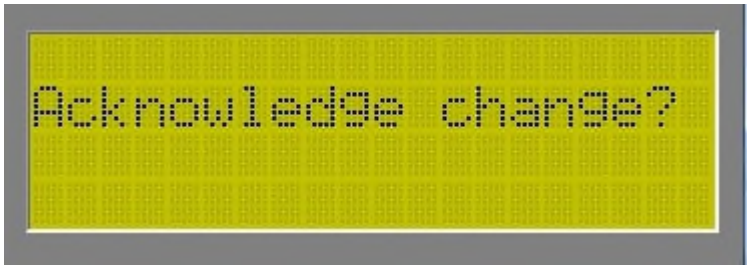
The message texts can be edited alphanumerically. The procedure is identical to that of numerical editing, but it is possible to select numbers and characters with the ↑ ↓ keys.



7.3.2.4 Confirmations

For safety reasons and to avoid erroneous settings, some functions require confirmation.

By confirming with the ↵ key the selected function is carried out. By pressing the **ESC** key the function is aborted.



7.4 Access Authorisation

The menu items Parameters and Diagnostics, resp. the functions and settings therein are secured by a 4-digit, numeric password.
Accordingly, a distinction is made between the following two hierarchical access levels (password levels).

Access level	Name of level	Pre-set password	Password necessary for...
B	operator	„1234"	refer to chapter 9.2
T	technician	„3456"	

If a password is asked for, it must be entered and confirmed with the ↵ key.

If a wrong password is entered, the menu level will not be displayed.

Press the **ESC** key to quit.

8 Operation of the installation by personnel

8.1 Changing the operating mode

During normal OPERATION, the *operating mode* can be changed by pressing the ↵ key (access to user menu). In the user menu, item *2 Operation mode* has to be selected and confirmed with ↵.

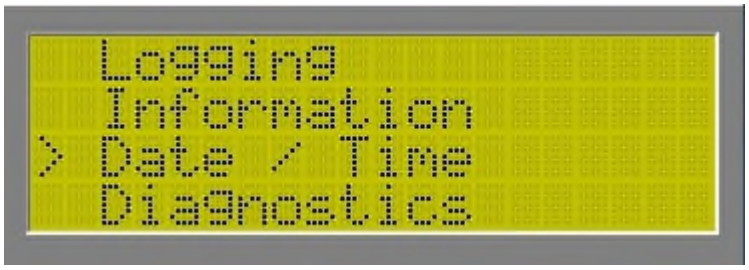
The operating modes screen is displayed, in which the desired *operating mode* can be selected with the ⇑ ⇓ keys.

Note:

- From the OPERATION mode it is only possible to change to OFF. A direct change to DISINFECTION or RINSING is not possible.
- From the DISINFECTION and RINSING mode it is only possible to change to OFF. A direct change to OPERATION is not possible.

8.2 Entering day and time

Day and time are entered by pressing the ↵ key (access to user menu). In the user menu, item 6 *Date / Time* has to be selected and confirmed with ↵.

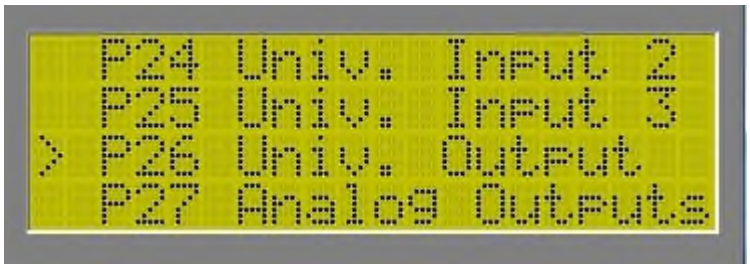


The input screen is displayed first. Once date and time have been set, the user is returned to the user menu.

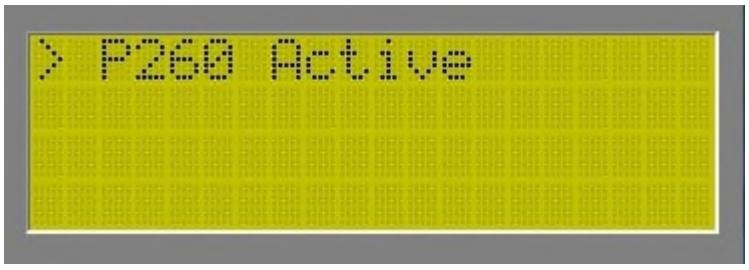
8.3 Parametrising the digital output

The *universal output* is parametrised by pressing the ↵ key (access to the user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select P26 *Univ. Output*.



The selection screen is displayed. Select P260 *Active*.



In the screen that follows, the system status for the selected universal output has to be selected.

The system status can be selected from:

- *1V01*
- *1V02*
- *1V03*
- *1P01*
- *Uni-DI1*
- *Uni-DI2*
- *Uni.-DI3*
- *Standby (Tank full)*
- *Rejection*
- *Production*
- *Concentrate…*
- *Disc. flushing*
- *Disinfection*
- *External stop*
- *Warning*
- *8L01*
- *8L04*
- *Always on*

As all selectable parametrisations have equal priority, the user must ensure that the contact is already providing voltage (closed) when one parameter has been met (connection using the logical OR operation) when making the adjustments.

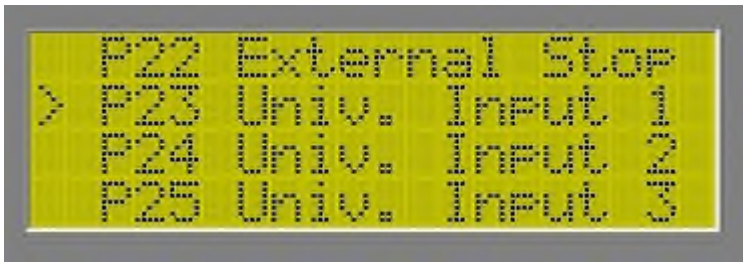
Note:

The unit connected to the universal output must have a sufficiently protective circuit with an RC-varistor in order to prevent a fault in the controller.

8.4 Parametrisation of digital inputs

The *universal inputs* are set by pressing the ↵ key (access to the user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select P23 *Univ. Input 1* or P24 *Univ. Input 2* or P25 *Univ. Input 3*.



Now set the *universal input* on the following screen.

The universal inputs must be set as follows:

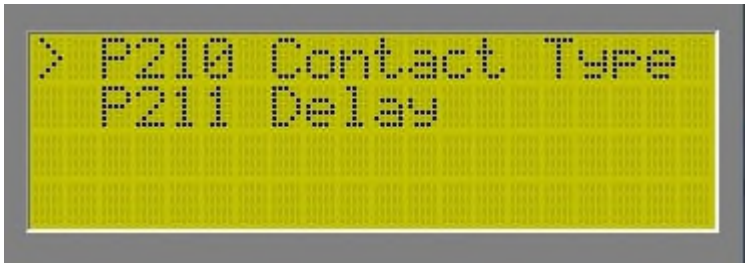
- P230 *Contact Type*: Selection of the connected contact (NO or NC).
- P231 *Text*: Message text for active inputs can be defined.
- P232 *Reaction*: Selection of the installation reaction to be triggered:
    - *No Reaction*
    - *Message*
    - *Switch Off*
    - *Emergency Off*
    - *Request*
- P233 *Active*: Selection of the installation conditions that will initiate an analysis of the universal input:
    - *Standby*
    - *Rejection*
    - *Production on*
    - *Concentrate…*
    - *Disc. Flushing*
    - *Disinfection*
    - *External Stop*
    - *Always on*
- P234 *Delay*: Adjustment of the delay for the activation of the input.

8.5 Parametrisation of standard inputs

The *standard inputs* (external stop, level switch, pressure switch, motor protection switch) are set by pressing the ↵ key (access to user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select P19 *8L02* or P20 *8L03* or P21 *Motor Protect* or P22 *External Stop*.

Now set the *input* on the following screen.



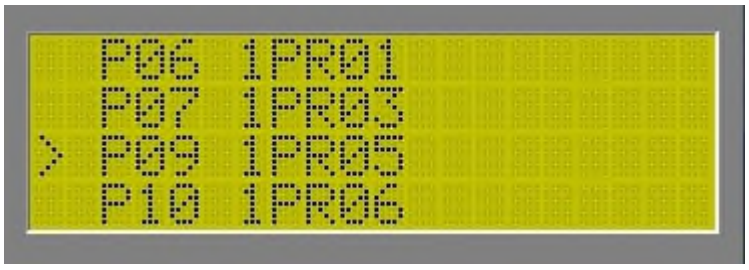
The *inputs* must be set as follows:

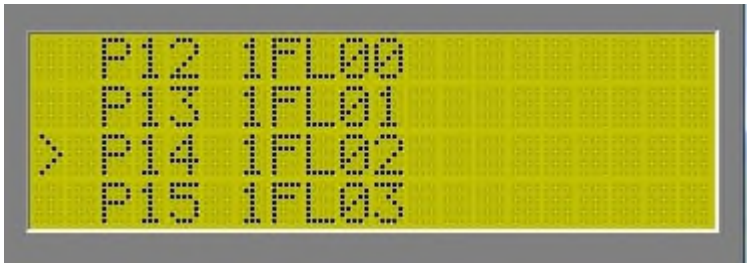
- *Contact Type*: Selection of the connected contact, *NO* or *NC*.
- *Delay*: Programming of the delay after input activation possible (not available for 8L02 or 8L03!)

8.6 Standard parametrisation of the analogue inputs

The *standard analogue inputs* are set (flow rates, pressure values) by pressing the ↵ key (access to the user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select the *Analogue input* that is to be set.





Now set the *input* on the following screen.

The *analogue inputs* must be set as follows:

- *Min. Range* – set the lower measuring range limit.
- *Max. Range* – set the upper measuring range limit.
- *Offset* – deviation of the measured value.

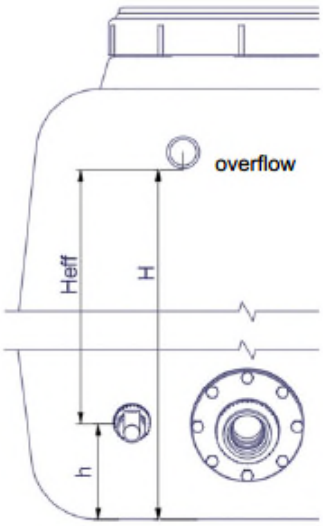
8.6.1 Connection of 8L00-mA sensor and sensor adjustment

Caution

It is the plant operator's duty to have any maintenance, control, and assembly work done by authorised and qualified technical staff. Before carrying out any work on electrical installations or units, make sure that the installation is free of electrical current. Ensure that the installation cannot be switched on unintentionally.

Instructions:

- ☞ The jumper of the analogue input to which the mA sensor is connected to must be set to **mA** and the system identification must be set to **8L00_mA** (number 7).
- ☞ See also following page



Two height values are required for sensor adjustment:

1.) The installation height from the centre of the sensor to the bottom of the tank.
2.) The height from the lower edge of the overflow to the bottom of the tank.

The resulting effective usable height H_{eff} must be adjusted then.
e.g.: Installation height of centre of sensor h = 150 [mm]
Height of lower edge of overflow H = 1200 [mm]
H_{eff} = H-h = 1200-150 [mm] = 1.05 [m]

Also required is the top sensor reading of the built-in measurement device,
e.g.: 0-0.2 [bar] correspond to 0-2 [m] water column.

The effective usable height H_{eff} must never be higher than the top sensor reading. E.g.: H_{eff} = 3 [m] and the top sensor reading is 0.2 [bar]. This means that the sensor cannot detect anything above 2 [m], because the signal is already at 20 [mA] at this height. In this example, 1 [m] of the tank would remain unused.

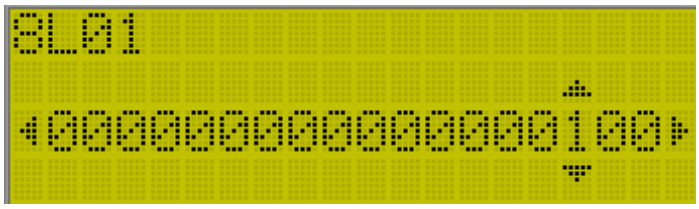
Then the calculation of parameter P181 is performed as follows:

$$P181 = \frac{Top\ pressure\ sensor\ reading}{H_{eff}} = \frac{2[\mathrm{m}]}{1.05[\mathrm{m}]} \times 100 = 190[\%]$$

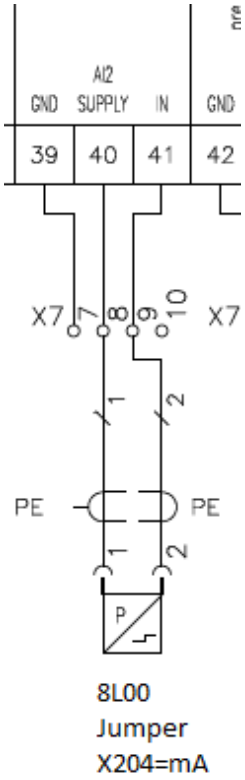
The other parameters P183 (10 [%]), P184 (60 [%]), P185 (80 [%]) and P186 (90 [%]) do not need to be calculated in this way, but refer to parameter P181, which now corresponds to 100 [%] resulting from the adjustment.

The dry run protection for the downstream pressure booster system, which is fed from the permeat tank containing the sensor, can be implemented by parameterising of the universal output 8L01.

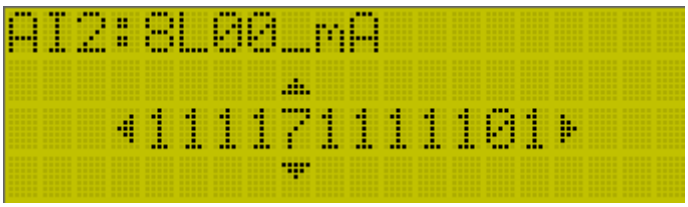
Picture 1 and 2: example of parameterising 8L01 dry run protection pressure booster system



Picture 3: example of an electrical connection 4-20mA sensor



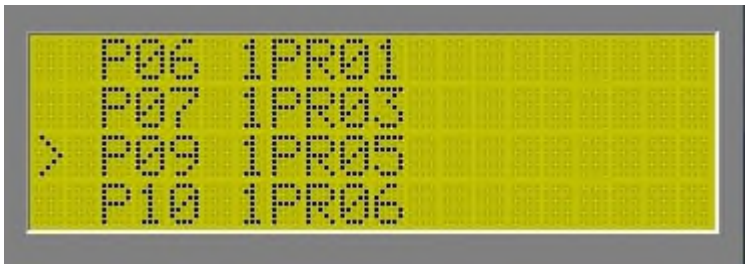
Picture 4: Example programming RO digital

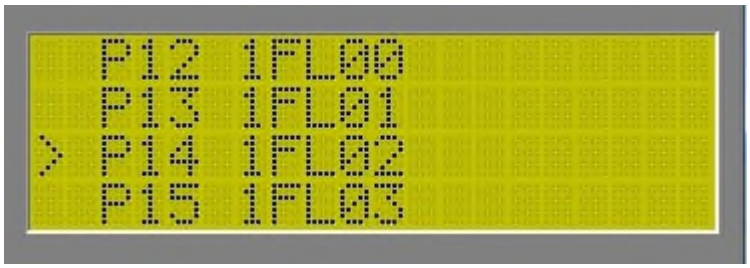


8.7 Setting the limit values

The *limits* are entered by pressing the ↵ key (access to the user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select the *Analogue input* for which the limits will be set.





Set the limits in the screen that is now displayed.

- *Max. Limit:* – set the limit value.

- *Limit Delay:* – set a time delay.
- *Limit React.:* – select the kind of reaction in case of limit exceedance.
    - o *No Reaction*
    - o *Warning*
    - o *Emergency Off*

8.8 Setting the times

The *times* (rinse, rejection, lack of pressure, etc.) are set by pressing the ↵ key (access to user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select the parameter for which the time will be set.

The *times* must be set as follows:

- P031 *Rinse Time:* setting of the duration of concentrate displacement/rinse.
- P033 *Interval:* setting of the duration of the automatic concentrate displacement/rinse.
- P041 *Rinse Durat.:* setting the duration of the discontinuous rinse.
- P042 *Rinse Interv.:* setting of the interval of the discontinuous rinse.
- P050 *Min. Time:* setting of the minimum duration of rejection after start-up.
- P051 *Max. Time:* setting of the maximum duration of rejection after start-up.
- P074 *Fault Delay:* setting of the priming delay for the **PUMP** 1P01 if there is pressure available.
- P074.1 *Fault Delay:* setting of the delay for initiation of the lack of pressure fault during priming, 1P01 not yet in operation mode.
- P075 *Fault Delay:* setting of the delay for initiation of the lack of pressure fault during priming.
- P076 *Start Delay:* setting of the delay for initiation of the lack of pressure fault during operation.
- P165 *Limit Delay:* setting of the delay before the temperature alarm is triggered.
- P173 *Warn Delay:* setting of the delay before the conductivity pre-alarm is triggered.
- P175 *Fault Delay:* setting of the delay before the conductivity alarm is triggered.

8.9 Selecting the parameters

The *parameters* (error display, tank type, etc.) are set by pressing the ↵ key (access to user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select the parameter for which the selection will be made.

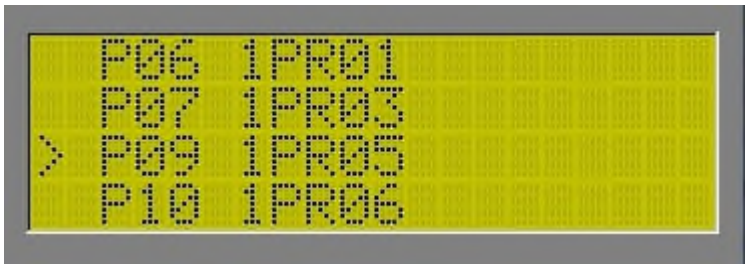
The *selection parameters* must be set as follows:

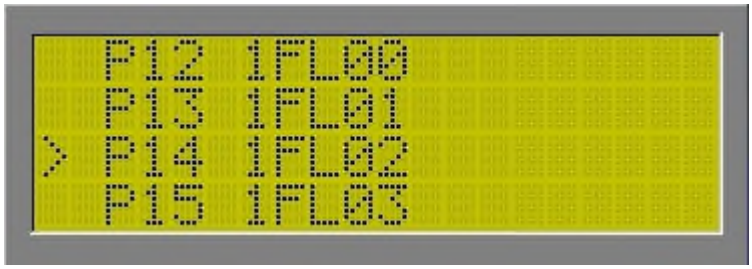
- P030 *Sequence*: select the rinsing type:
  - *Displacement* (without pump)
  - *Flushing* (with pump)
- P032 *Forced Rinse*: select whether there should be forced rinse during operation:
  - *Not Active*
  - *Active*
- P040 *Type of Rinse*: select the discontinuous rinsing type:
  - *Displacement* (without pump)
  - *Flushing* (with pump)
- P280 *Sel. T- Type*: select the tank type:
  - *With overflow* (permeate valve opened during disc. rinse/ concentrate displacement/ concentrate rinse)
  - *Without overflow* (permeate valve closed during disc. rinse/ concentrate displacement/ concentrate rinse)

8.10 Selecting the alarm options

The *alarm options* are set by pressing the ↵ key (access to the user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select the analogue parameters for which the *Alarm options* will be selected.





For the *Alarm options* the following parameters may be chosen:

- *NO Reaction*: no effect on installation operation.
- *Warn*: the installation remains in operation if an alarm is active.
- *Emergency Off*: the installation is stopped if an alarm is active.

Note:

If the *cond perm* or *T permeate* alarm is active, the installation reacts immediately after detection of the fault; the alarm message, however, is displayed with the delay that has previously been set.

8.11 Carrying out a reset

A RESET (*summation, system, calibration*) is carried out pressing the ↵ key (access to the user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select P29 *Reset*.

The settings screen is displayed from which a *Reset* (P290 to P292) is to be selected.

P290 Summation (-Reset)

This menu option allows the flow and operating hours sums to be RESET.

P291 Settings (-Reset)

This menu option allows the controller to be RESET to factory settings from any installation mode.

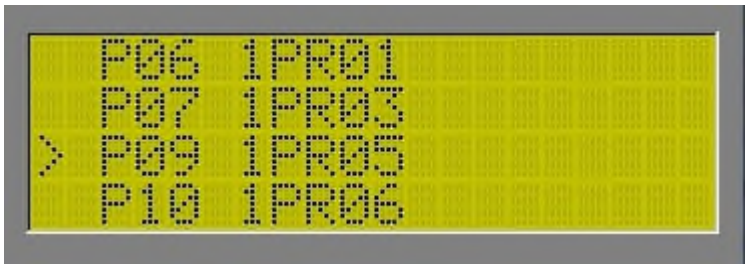
P292 Calibration (-Reset):

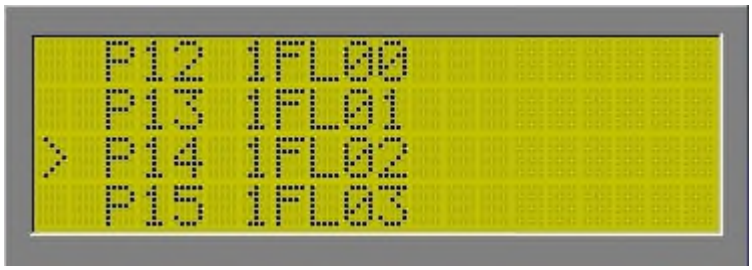
The sensors of the controller have been calibrated to standard values at delivery. These standard values must be adapted manually to local requirements. If these calibration data have been modified and should then be reset to standard settings, a calibration RESET must be carried out.

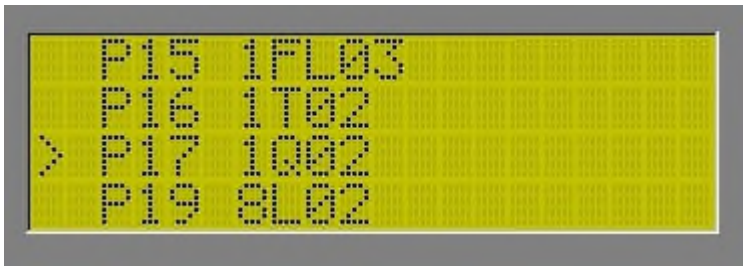
8.12 Measuring and calibrating

Measuring and calibrating of the sensors is carried out by pressing the ↵ key (access to the user menu). In the user menu, item 3 *Parameters* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.

The settings screen is displayed. Select the *analogue parameters* that will be calibrated.







For calibration the following parameters may be chosen:

- *Min. Range* – set the lower measuring range limit.
- *Max. Range* – set the upper measuring range limit.
- Offset – deviation of the measured value.

Calibration of the conductivity measurement is carried out by means of a comparative measurement.

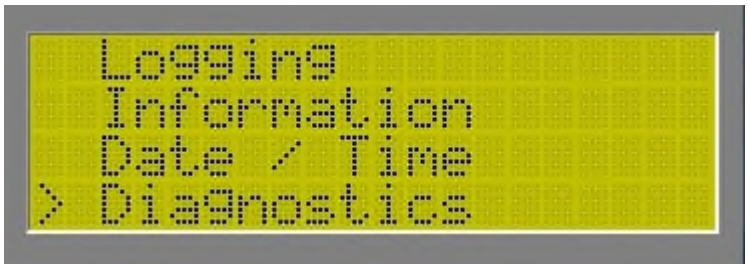
- Calibration: input of the currently measured reference conductivity as the upper reference point for the conductivity measurement.

Note:

The sensors have to be recalibrated once a year!

8.13 Diagnostics

The *Diagnostics* of the installations sensors is carried out by pressing the ↵ key (access to the user menu). In the user menu, item 7 *Diagnostics* has to be selected and confirmed with ↵. The relevant *password* must be entered when the request for password input is displayed.



After entering the correct password the *diagnostics* screen will be opened in the editing mode and the control changes to operating mode **OFF**, i.e. all outputs are switched off. After entering the wrong password the *diagnostics* screen will not be opened.

In the displayed *diagnostics* screen select which input should be monitored or which output should be manipulated.

These submenus make it possible to test all the inputs and outputs of the controller and therefore also to control the unit manually.

Digital Inputs:

The operating modes of the digital inputs *external stop, motor protection, level 8L02, level 8L03 and universal input 1-3*.

Digital Outputs:

The outputs of the controller are displayed and controlled. Chose an output with the cursor key in order to control it. (The output designation is shown in plain text.) It can be controlled with the ⇑ ⇓ keys.

Note:

The units connected to the controller outputs are triggered without any safety devices if the respective output is actuated in diagnosis mode!

Analogue Inputs:

The measuring values of the analogue inputs are displayed.

Analogue Outputs:

The analogue outputs of the controller are displayed.

Closing the "Diagnostics" option:
After testing any inputs and outputs, the operator can return to the main menu, by pressing the **ESC** key.

When quitting the *diagnostics* screen out of the display mode the control will then be in the same state as it was when the *diagnostics* screen was entered, even if the various screens had been left with changed settings, entered during diagnosis.

Attention!

When quitting the *diagnostics* screen out of the editing mode, the control stays in operating mode **OFF!**

8.14 Operating log

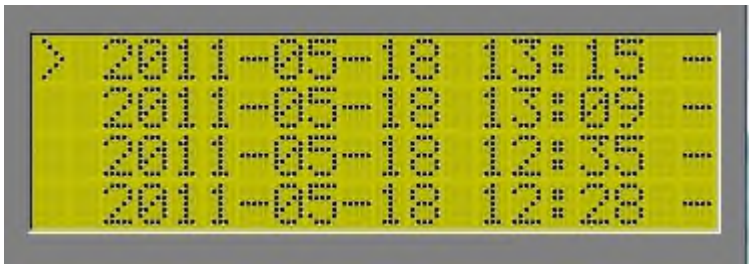
After the controller has been switched on, the data are logged constantly in an operating log. This mainly aids finding the cause for a fault more quickly.

Press the ↵ key to display the operating log (access to user menu). In the user menu, item 4 *Logging* has to be selected and confirmed with ↵.

The following options are shown:

Chose from:

- *All Records*: list of all records in the memory.
- *Error Records:* list of all errors in the memory.



Press the ↵ key to view the details of the selected entry. Within the details screen, use the ← → keys to scroll through the entries in chronological order. Use the ↑ ↓ keys to scroll within the entry shown.

9 Basic settings / parametrisation

9.1 P01 Machine Identification Code

The machine identification code is a 12-digit code defining the unit's input and output assignation. Each digit refers to a different input or output. The figure defines the type and/or function of the respective input or output, makes sure the right parameters are shown or hidden, and controls screens configuration.

Note:

Changing the machine identification code will reset the operating log.

Use the ← → keys to navigate from one digit to another and use the ↑ ↓ keys to set one digit to a defined value.

Terminal <Text>	Selection <Text>	Remarks
13-15 <MV1>	0 <disabled> **1** <enabled>	
16-18 <MV2>	0 <disabled> **1** <enabled>	
19-21 <MV3>	0 <disabled> **1** <enabled>	
36-38 <AI1>	**1** <1PR03_V> 2 <1PR03_mA>	The selected value must correspond to the jumper setting (see chapter 5.1 Setting the analogue inputs 0.5–3.5 V/ 4-20mA)!
39-41 <AI2>	**0** <disabled> 1 <1PR04_V> 2 <1PR04_mA> 3 <1PR01_V> 4 <1PR01_mA> 5 <1PR07_V> 6 <1PR07_mA> 7 <8L00_mA> 8 <8L00_V>	The selected value must correspond to the jumper setting (see chapter 5.1 Setting the analogue inputs 0.5–3.5 V/ 4-20mA)!
42-44 <AI3>	0 <disabled> **1** <1PR05_V> 2 <1PR05_mA>	The selected value must correspond to the jumper setting (see chapter 5.1 Setting the analogue inputs 0.5–3.5 V/ 4-20mA)!
45-47 <AI4>	0 <disabled> **1** <1PR06_V> 2 <1PR06_mA> 3 <1PR01_V> 4 <1PR01_mA> 5 <1PR07_V> 6 <1PR07_mA> 7 <8L00_mA> 8 <8L00_V>	The selected value must correspond to the jumper setting (see chapter 5.1 Setting the analogue inputs 0.5–3.5 V/ 4-20mA)!
48-50 <AI5>	0 <disabled> 1 <1FL01_V> 2 <1FL01_mA> **3** <1FL00_V> 4 <1FL00_mA>	The selected value must correspond to the jumper setting (see chapter 5.1 Setting the analogue inputs 0.5–3.5 V/ 4-20mA)!

Terminal <Text>	Selection <Text>	Remarks
51-53 <AI6>	0 <disabled> **1** <1FL02_V> 2 <1FL02_mA>	The selected value must correspond to the jumper setting (see chapter 5.1 Setting the analogue inputs 0.5–3.5 V/ 4-20mA)!
54 <AI7>	0 <disabled> **1** <enabled>	0 ==> temperature compensation 1Q02 disabled, conductivity measurement 1Q02 without temperature compensation
55-57 <AI8>	**0** <disabled> 1 <1FL03_V> 2 <1FL03_mA> 3 <1PR01_V> 4 <1PR01_mA> 5 <1PR07_V> 6 <1PR07_mA> 7 <8L00_mA> 8 <8L00_V> 9 <1FL04_V> : <1FL04_mA>	The selected value must correspond to the jumper setting (see chapter 5.1 Setting the analogue inputs 0.5–3.5 V/ 4-20mA)!
58-60 <COND>	0 <disabled> **1** <enabled>	0 ==> conductivity measurement 1Q02 disabled

Default settings are **bold**

9.2 List of parameters

Note:

Parameters may be non-visible, depending on the machine signature/ identification code that has been programmed.

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P01 Machine Sign.						**T**
P010	Refer to chapter 9.1 P01 Machine identification code	12 digits number code defining IO-settings of each unit				**T**
P02 Language						**B**
P020	Sel. Language	Change of language settings		- Deutsch - English - Français - Español		**B**
P03 Shutdown						**T**
P030	Sequence	Selection of rinsing method		-Displace ment -Flushing		**T**
P031	Rinse Time	Duration of displacement / flushing	xx h xx min xx s			**T**
P032	Forced Rinse	Selection of forced rinse during operation		- active - not active		**T**
P033	Interval	Duration of forced rinse	xx h xx min xx s			**T**
P034	Delay	Delay of automatic concentrate displacement / flushing	xx h xx min xx s			**T**
P04 Standby						**T**
P040	Type of Rinse	Selection of discontinuous rinsing method		-Displace ment -Flushing		**T**
P041	Rinse Durat.	Setting of duration discontinuous rinsing	xx h xx min xx s			**T**
P042	Rinse Interv.	Setting of duration discontinuous rinse interval	xx h xx min xx s			**T**
P05 1V02						**T**
P050	Min. Time	Setting of min. duration of rejection after start	xx h xx min xx s			**T**
P051	Max. Time	Setting of max. duration of rejection after start	xx h xx min xx s			**T**

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P06 1PR01						**T**
P060	Min. Range	Low limit measuring range	bar	0.0 - 99.9		**T**
P061	Max. Range	High limit measuring range	bar	0.0 - 99.9		**T**
P062	Offset	Offset for measured value display	bar	-9.9...+9.9		**T**
P063	Max. Limit	limit	bar	0.0 - 99.9		**T**
P064	Limit Delay	Delay time	xx h xx min xx s			**T**
P065	Limit React.	Selection of reaction at limit exceedance		- No Reaction - Warn - Emergency Off		**T**
P07 1PR03						**T**
P070	Min. Range	Low limit measuring range	bar	0.0 - 99.9		**T**
P071	Max. Range	High limit measuring range	bar	0.0 - 99.9		**T**
P072	Offset	Offset for measured value display	bar	-9.9...+9.9		**T**
P073.1	Limit Stop	Stop at low-pressure	bar	0.0 - 99.9		**T**
P073.2	Limit Start	Start after low-pressure	bar	0.0 - 99.9		**T**
P074	Fault Delay	Setting of start-up delay pump, when pressure is available	xx h xx min xx s			**T**
P074.1	Delay fault relay	Setting of delay of forwarding to fault signal relay	xx h xx min xx s			**T**
P075	Fault Delay	Setting of delayed triggering at low-pressure fault during start	xx h xx min xx s			**T**
P076	Start Delay	Setting of delayed triggering at low-pressure fault during operation	xx h xx min xx s			**T**
P077	Max. Limit	limit	bar	0.0 - 99.9		**T**
P078	Limit Delay	Delay time	xx h xx min xx s			**T**
P079	Limit React.	Selection of reaction at limit exceedance		- No Reaction - Warn - Emergency Off		**T**

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P08 1PR04						**T**
P080	Min. Range	Low limit measuring range	bar	0.0 - 99.9		**T**
P081	Max. Range	High limit measuring range	bar	0.0 - 99.9		**T**
P082	Offset	Offset for measured value display	bar	-9.9...+9.9		**T**
P083	Max. Limit	limit	bar	0.0 - 99.9		**T**
P084	Limit Delay	Delay time	xx h xx min xx s			**T**
P085	Limit React.	Selection of reaction at limit exceedance		- No Reaction - Warn - Emergency Off		**T**
P09 1PR05						**T**
P090	Min. Range	Low limit measuring range	bar	0.0 - 99.9		**T**
P091	Max. Range	High limit measuring range	bar	0.0 - 99.9		**T**
P092	Offset	Offset for measured value display	bar	-9.9...+9.9		**T**
P093	Max. Limit	limit	bar	0.0 - 99.9		**T**
P094	Limit Delay	Delay time	xx h xx min xx s			**T**
P095	Limit React.	Selection of reaction at limit exceedance		- No Reaction - Warn - Emergency Off		**T**
P10 1PR06						**T**
P100	Min. Range	Low limit measuring range	bar	0.0 - 99.9		**T**
P101	Max. Range	High limit measuring range	bar	0.0 - 99.9		**T**
P102	Offset	Offset for measured value display	bar	-9.9...+9.9		**T**
P11 1PR07						**T**
P110	Min. Range	Low limit measuring range	bar	0.0 - 99.9		**T**
P111	Max. Range	High limit measuring range	bar	0.0 - 99.9		**T**
P112	Offset	Offset for measured value display	bar	-9.9...+9.9		**T**
P113	Max. Limit	limit	bar	0.0 - 99.9		**T**
P114	Limit Delay	Delay time	xx h xx min xx s			**T**
P115	Limit React.	Selection of reaction at limit exceedance		- No Reaction - Warn - Emergency Off		**T**

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P12 1FL00						**T**
P120	Unit	Selection of unit		- l/h - m³/h		**T**
P121	Min. Range	Low limit measuring range		0.0 - 9999.9		**T**
P122	Max. Range	High limit measuring range		0.0 - 9999.9		**T**
P123	Offset	Offset for measured value display		-99.9...+99.9		**T**
P124	Min. Limit	Lower limit		0.0 - 9999.9		**T**
P125	Max. Limit	Upper limit		0.0 - 9999.9		**T**
P126	Warn Delay	Delay time	xx h xx min xx s			**T**
P127	Fault Delay	Delay time	xx h xx min xx s			**T**
P128	Limit React.	Selection of reaction at limit exceedance		- No Reaction - Warn - Emergency Off		**T**
P13 1FL01						**T**
P130	Unit	Selection of unit		- l/h - m^3/h		**T**
P131	Min. Range	Low limit measuring range		0.0 - 9999.9		**T**
P132	Max. Range	High limit measuring range		0.0 - 9999.9		**T**
P133	Offset	Offset for measured value display		-99.9...+99.9		**T**
P134	Min. Limit	Lower limit		0.0 - 9999.9		**T**
P135	Max. Limit	Upper limit		0.0 - 9999.9		**T**
P136	Warn Delay	Delay time	xx h xx min xx s			**T**
P137	Fault Delay	Delay time	xx h xx min xx s			**T**
P138	Limit React.	Selection of reaction at limit exceedance		- No Reaction - Warn - Emergency Off		**T**

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P14 1FL02						**T**
P140	Unit	Selection of unit		- l/h - m³/h		**T**
P141	Min. Range	Low limit measuring range		0.0 - 9999.9		**T**
P142	Max. Range	High limit measuring range		0.0 - 9999.9		**T**
P143	Offset	Offset for measured value display		-99.9...+99.9		**T**
P144	Min. Limit	Lower limit		0.0 - 9999.9		**T**
P145	Max. Limit	Upper limit		0.0 - 9999.9		**T**
P146	Warn Delay	Delay time	xx h xx min xx s			**T**
P147	Fault Delay	Delay time	xx h xx min xx s			**T**
P148	Limit React.	Selection of reaction at limit exceedance		- No Reaction - Warn - Emergency Off		**T**
P15 1FL03						**T**
P150	Unit	Selection of unit		- l/h - m³/h		**T**
P151	Min. Range	Low limit measuring range		0.0 - 9999.9		**T**
P152	Max. Range	High limit measuring range		0.0 - 9999.9		**T**
P153	Offset	Offset for measured value display		-99.9...+99.9		**T**
P154	Min. Limit	Lower limit		0.0 - 9999.9		**T**
P155	Max. Limit	Upper limit		0.0 - 9999.9		**T**
P156	Warn Delay	Delay time	xx h xx min xx s			**T**
P157	Fault Delay	Delay time	xx h xx min xx s			**T**
P158	Limit React.	Selection of reaction at limit exceedance		- No Reaction - Warn - Emergency Off		**T**
P50 1FL04						**T**
P500	Unit	Selection of unit		- l/h - m³/h		**T**
P501	Min. Range	Low limit measuring range		0.0 - 9999.9		**T**
P502	Max. Range	High limit measuring range		0.0 - 9999.9		**T**
P503	Offset	Offset for measured value display		-99.9...+99.9		**T**

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P16 1T02						**B**
P160	Min. Range	Low limit measuring range	°C	0 - 100		**T**
P161	Max. Range	High limit measuring range	°C	0 - 100		**T**
P162	Offset	Offset for measured value display	°C	-9.9...+9.9		**T**
P163	Min. Limit	Lower limit	xx.x °C	0.0 - 99.9		**B**
P164	Max. Limit	Upper limit	xx.x °C	0.0 - 99.9		**B**
P165	Fault Delay	Setting of delayed triggering at temperature fault	xx h xx min xx s			**B**
P166	Limit React.	Selection of reaction at limit exceedance		- not active - active		**B**
P17 1Q02						**B**
P171	Calibration	Reference value for maximum	xxx µS/cm	0 - 999		**T**
P172	Limit Warn	Conductivity exceeded	xxx µS/cm	0 - 999		**B**
P173	Warn Delay	Setting of delayed triggering for conductivity pre-warning	xx h xx min xx s			**B**
P174	Limit Fault	Release permeate max. alarm permeate too high	xxx µS/cm	0 - 999		**B**
P175	Fault Delay	Setting of delayed triggering for conductivity fault	xx h xx min xx s			**B**
P176	Limit React.	Selection of reaction at limit exceedance		- not active - active		**B**
P18 8L00						**T**
P180	>< min	Reference value for minimum	%	0 - 999		**T**
P181	>< max	Reference value for maximum	%	0 - 999		**T**
P182	Offset	Offset for measured value display	%	-9.9...+9.9		**T**
P183	Limit Dry	Dry-run protection	%	0 - 100		**T**
P184	RO Start	Start the unit	%	0 - 100		**T**
P185	RO Stop	Stop the unit	%	0 - 100		**T**
P186	Full Alarm	Tank overfull	%	0 - 100		**T**

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P19 8L02						**T**
P190	Contact Type	Selection of connected contact		- NO - NC		**T**
P20 8L03						**T**
P200	Contact Type	Selection of connected contact		- NO - NC		**T**
P21 Motor Protect						**T**
P210	Contact Type	Selection of connected contact		- NO - NC		**T**
P211	Delay	Setting of delay after activation of the input	xx h xx min xx s			**T**
P22 External Stop						**T**
P220	Contact Type	Selection of connected contact		- NO - NC		**T**
P221	Delay	Setting of delay after activation of the input	xx h xx min xx s			**T**
P23 Univ. Input 1						**T**
P230	Contact Type	Selection of connected contact		- NO - NC		**T**
P231	Text	Text display at active input	Feel free for own wording			**T**
P232	Reaction	Selection of following reaction	- No Reaction - Message - Warning - Switch Off (Tank full) - Emergency Off - Level Request			**T**
P233	Active	Selection of operation modes where universal input has to be evaluated	Standby Rejection Production on Displacement Disc. Flushing Disinfection External Stop Always on			**T**
P234	Delay	Setting of delay after activation of the input	xx h xx min xx s			**T**

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P24 Universal input 2						**T**
P240	Contact Type	Selection of connected contact		- NO - NC		**T**
P241	Text	Text display at active input	Feel free for own wording			**T**
P242	Reaction	Selection of following reaction	- No Reaction - Message - Warning - Switch Off (Tank full) - Emergency Off - Level Request			**T**
P243	Active	Selection of operation modes where universal input has to be evaluated	Standby Rejection Production on Displacement Disc. Flushing Disinfection External Stop Always On			**T**
P244	Delay	Setting of delay after activation of the input	xx h xx min xx s			**T**

Parameter	Function	Short desription	Format/ Unit	Options/ Range	Individual setting	Password level
P25 Universal input 3						**T**
P250	Contact Type	Selection of connected contact		- NO - NC		**T**
P251	Text	Text display at active input	Feel free for own wording			**T**
P252	Reaction	Selection of following reaction	- No Reaction - Message - Warning - Switch Off (Tank full) - Emergency Off - Level Request			**T**
P253	Active	Selection of operation modes where universal input has to be evaluated	Standby Rejection Production on Displacement Disc. Flushing Disinfection External Stop Always On			**T**
P254	Delay	Setting of delay after activation of the input	xx h xx min xx s			**T**
P26 Univ. Output						**T**
P260	Active	Digital output controlled, if…	- 1V01 - 1V02 - 1V03 - 1P01 - Uni-DI1 - Uni-DI2 - Uni-DI3 - Standby - Rejection - Production on - Displacement - Disc. Flushing - Disinfection - External Stop - Warning - 8L01 - 8L04 - Always On			**T**

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P27 Analogue Outputs:						**T**
P270	AO1 >< 4mA	Lower calibration value				**T**
P271	AO1 >< 20mA	Upper calibration value				**T**
P272	AO1 20mA=	Full scale value				**T**
P273	AO1 Value	Output analogue value…		- 1Q02 - 1T02 - 1FL00 - 1FL01 - 1FL02 - 1PR01 - 1PR03 - 1PR05 - 1PR06 - 1PR07 - 8L00		**T**
P274	AO2 >< 4mA	Lower calibration value				**T**
P275	AO2 >< 20mA	Upper calibration value				**T**
P276	AO2 20mA=	Full scale value				**T**
P277	AO2 Value	Output analogue value…		- 1Q02 - 1T02 - 1FL00 - 1FL01 - 1FL02 - 1PR01 - 1PR03 - 1PR05 - 1PR06 - 1PR07 - 8L00		**T**
P28 Tank Type						**T**
P280	Sel T-Type	Selection of tank type		- with overflow - without overflow		**T**
P29 Reset						**T**
P290	Summation	Reset of quantification of flow measurements and operating hours				**T**
P291	Settings	Reset the control into ex-factory condition, out of any arbitrary operating mode.				**T**
P292	Calibration	Reset to recall standard settings, after calibration data has been changed				**T**

Parameter	Function	Short description	Format/ Unit	Options/ Range	Individual setting	Password level
P30 RS232 interface						**T**
P300	baud-rate service	setting baud-rate	baud	9600 19200 38400 57600 115200	115200	**T**
P301	Baud-rate external	setting baud-rate	baud	9600 19200 38400 57600 115200	115200	**T**

10 Faults and their elimination

10.1 Indication and acknowledgement

The current, non-acknowledged error messages are displayed in the error screen of the corresponding operating mode.

Functional sequence in case of a fault:

- The LED **FAULT** at the controller front panel flashes.
- The **ALARM RELAY** is activated.
- The **ESC** key is assigned the function "*acknowledge alarm relay*".

Once the **ESC** key is pressed:

- The **ALARM RELAY** is reset.
- The controller returns to the error screen of the corresponding operating mode.
- The automatic scroll mode stops.
- You can continue to scroll through the screens manually.
- The **ESC** key is assigned the function "*error acknowledgement*".
- The acknowledged error messages are erased from the error screen.

If all error messages have been acknowledged individually by pressing the **ESC** key,

- the system will return to normal display mode.

10.2 Description of and search for faults

Note!
According to language setting the fault message is displayed in plain text as shown in brackets hereafter.

10.2.1 1Pr03 (Feed pressure low) ▼▼▼; Pressure 1Pr03<P073.1

During operation, this alarm is triggered with a delay if there is a lack of pressure.

Cause	Remedy
Feed water pressure too low	- Check pressure difference at the water softener - Increase feed water pressure
Filter clogged	Replace filter cartridge
Pressure probe defective	Replace pressure sensor
Inlet valve 1V01 defective	Replace valve

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.

This time delay can be reset with **ESC**.

Adjust the delay of forwarding to fault relay by P074.1 (terminal 7, 8, 9).

10.2.2 1Pr03 (Feed pressure low) ▼▼▼; Pressure 1Pr03<P073.2

During start/reject, this alarm is triggered with a delay if there is a lack of pressure.

Cause	Remedy
Feed water pressure too low	- Check pressure difference at the water softener - Increase feed water pressure
Filter clogged	Replace filter cartridge
Pressure probe defective	Replace pressure sensor
Inlet valve 1V01 defective	Replace valve

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.

This time delay can be reset with **ESC**.

Adjust the delay of forwarding to fault relay by P074.1 (terminal 7, 8, 9).

10.2.3 1Pr03 (Feed pressure high) ▲▲▲; Pressure 1Pr03>P077

During operation, this alarm is triggered with a delay if there is an excess of pressure.

Cause	Remedy
Feed water pressure too high	- Check the pressure rise of the feed water - Decrease the feed water pressure
Pressure probe defective	Replace pressure sensor

10.2.4 Motor protection; Hard water

The signalling contact of the **MOTOR PROTECTION SWITCH** is evaluated in combination with the signalling contact of the **HARD WATER SENSOR**. If no signal is emitted, this alarm is triggered.

Cause	Remedy
Hard water sensor triggered (if any)	- Check soft water quality - Check sensor and replace if necessary
Jumper defective	Repair jumper
Motor protection switch triggered (if any)	- Check the motor protection switch settings - Check motor

10.2.5 1Q02 (Conduct. Warning) ▲; 1Q02>P172

The permeate conductivity is monitored against two limits. If the first limit is exceeded, a pre-warning is displayed.

Cause	Remedy
Feed water conductivity too high	Calculate demineralisation rate
Demineralisation rate too low	After having consulted the manufacturer - clean modules - replace modules

10.2.6 1Q02 (High conductivity) ▲▲▲; 1Q02>P174

The permeate conductivity is monitored against two limits. If the second limit is exceeded, an error message is displayed and the permeate valve 1V02 is closed.

Cause	Remedy
Feed water conductivity too high	Calculate demineralisation rate
Demineralisation rate too low	After having consulted the manufacturer - clean modules - replace modules

10.2.7 1T02 (Low temperature) ▼▼▼; 1T02<P163

The permeate temperature is monitored against a settable upper and lower limit. If the temperature falls below the lower limit, this error message is displayed.

10.2.8 1T02 (High temperature) ▲▲▲; 1T02>P164

The permeate temperature is monitored against a settable upper and lower limit. If the value exceeds the upper limit, this error message is displayed.

10.2.9 1Fl00 (Warn. feedwater low) ▼; 1Fl00<P124

The flow rate at the RO inlet is monitored against a settable upper and lower limit. If the value falls below the lower limit, this warning is displayed before an error message is shown.

10.2.10 1Fl00 (Fault feedwater low) ▼▼▼; 1Fl00<P124

The flow rate at the RO inlet is monitored against a settable upper and lower limit. If the flow rate remains below the lower limit for a longer time, first a warning and then this error message is displayed.

Cause	Remedy
Feed water pressure too low	- Check the pressure rise of the feed water - Increase feed water pressure
Flow sensor defective	Replace flow sensor

10.2.11 1Fl00 (Warn. feedwater high) ▲; 1Fl00>P125

The flow rate at the RO inlet is monitored against a settable upper and lower limit. If the upper limit is exceeded, this warning is displayed before an error message is shown.

10.2.12 1Fl00 (Fault feedwater high) ▲▲▲; 1Fl00>P125

The flow rate at the RO inlet is monitored against a settable upper and lower limit. If the flow rate remains above the upper limit for a longer time, first a warning and then this error message is displayed.

Cause	Remedy
Feed water pressure too high	- Check the pressure rise of the feed water - Decrease the feed water pressure
Flow sensor defective	Replace flow sensor

10.2.13 1Fl01 (Warn. concentr. Low) ▼; 1Fl01<P134

The concentrate flow rate towards the drain is monitored against a settable upper and lower limit. If the value falls below the lower limit, this warning is displayed before an error message is shown.

10.2.14 1Fl01 (Fault concentr. Low) ▼▼▼; 1Fl01<P134

The concentrate flow rate towards the drain is monitored against a settable upper and lower limit. If the flow rate remains below the lower limit for a longer time, first a warning and then this error message is displayed.

Cause	Remedy
Valve settings have been changed	- Check valve settings - Reconfigure the installation
Flow sensor defective	Replace flow sensor

10.2.15 1Fl01 (Warn. concentr. High) ▲; 1Fl01>P135

The concentrate flow rate towards the drain is monitored against a settable upper and lower limit. If the upper limit is exceeded, this warning is displayed before an error message is shown.

10.2.16 1Fl01 (Fault concentr. High) ▲▲▲; 1Fl01>P135

The flow rate of the concentrate to the drain is monitored against a settable upper and lower limit. If the flow rate remains above the upper limit for a longer time, first a warning and then this error message is displayed.

Cause	Remedy
Valve settings have been changed	- Check valve settings - Reconfigure the installation
Flow sensor defective	Replace flow sensor

10.2.17 1Fl02 (Warn. permeate low) ▼; 1Fl02<P144

The permeate flow rate is monitored against a settable upper and lower limit. If the value falls below the lower limit, this warning is displayed before an error message is shown.

10.2.18 1Fl02 (Fault permeate low) ▼▼▼; 1Fl02<P144

The permeate flow rate is monitored against a settable upper and lower limit. If the flow rate remains below the lower limit for a longer time, first a warning and then this error message is displayed.

Cause	Remedy
Valve settings have been changed	- Check valve settings - Reconfigure the installation
Flow sensor defective	Replace flow sensor

10.2.19 1Fl02 (Warn. permeate high) ▲; 1Fl02>P145

The permeate flow rate is monitored against a settable upper and lower limit. If the upper limit is exceeded, this warning is displayed before an error message is shown.

10.2.20 1Fl02 (Fault permeate high) ▲▲▲; 1Fl02>P145

The permeate flow rate is monitored against a settable upper and lower limit. If the flow rate remains above the upper limit for a longer time, first a warning and then this error message is displayed.

Cause	Remedy
Valve settings have been changed	- Check valve settings - Reconfigure the installation
Flow sensor defective	Replace flow sensor

10.2.21 1Fl03 (Warn. recirc. Low) ▼; 1Fl03<P154

The concentrate recirculation flow rate is monitored against a settable upper and lower limit. If the value falls below the lower limit, this warning is displayed before an error message is shown.

10.2.22 1Fl03 (Fault recirc. Low) ▼▼▼; 1Fl03<P154

The concentrate recirculation flow rate is monitored against a settable upper and lower limit. If the flow rate remains below the lower limit for a longer time, first a warning and then this error message is displayed.

Cause	Remedy
Valve settings have been changed	- Check valve settings - Reconfigure the installation
Flow sensor defective	Replace flow sensor

10.2.23 1Fl03 (Warn. recirc. high) ▲; 1Fl03>P155

The concentrate recirculation flow rate is monitored against a settable upper and lower limit. If the upper limit is exceeded, this warning is displayed before an error message is shown.

10.2.24 1Fl03 (Fault recirc. High) ▲▲▲; 1Fl03>P155

The concentrate recirculation flow rate is monitored against a settable upper and lower limit. If the flow rate remains above the upper limit for a longer time, first a warning and then this error message is displayed.

Cause	Remedy
Valve settings have been changed	- Check valve settings - Reconfigure the installation
Flow sensor defective	Replace flow sensor

10.2.25 1Pr01 (Supply pressure high) ▲▲▲; 1Pr01>P063

The pressure at the RO inlet is monitored against a settable upper limit. If the value exceeds the upper limit, this error message is displayed.

Cause	Remedy
Feed water pressure too high	- Check the pressure rise of the feed water - Decrease the feed water pressure
Pressure probe defective	Replace pressure sensor

10.2.26 1Pr04 (Pump pressure high) ▲▲▲; 1Pr04>P083

The pump pressure is monitored against a settable upper limit. If the value exceeds the upper limit, this error message is displayed.

Cause	Remedy
Feed water pressure too high	- Check the pressure rise of the feed water - Decrease the feed water pressure
RO pump	Check RO pump
Pressure probe defective	Replace pressure sensor

10.2.27 1Pr05 (Oper. pressure high) ▲▲▲; 1Pr05>P093

The operating pressure is monitored against a settable upper limit. If the value exceeds the upper limit, this error message is displayed.

Cause	Remedy
Valve settings have been changed	- Check valve settings - Reconfigure the installation
Pressure probe defective	Replace pressure sensor

10.2.28 1Pr07 (Perm. pressure high) ▲▲▲; 1Pr07>P113

The permeate pressure is monitored against a settable upper limit. If the value exceeds the upper limit, this error message is displayed.

Cause	Remedy
Valve settings have been changed	- Check valve settings - Reconfigure the installation
Pressure probe defective	Replace pressure sensor

10.2.29 8L01 (Low level alarm) ▼▼▼; 8L01<P183

The permeate tank level is monitored against a settable lower limit. If the level falls below the lower limit, this error message is displayed.

10.2.30 8L04 (High level alarm) ▲▲▲; 8L04>P186

The permeate tank level is monitored against a settable upper limit. If the level exceeds the upper limit, this error message is displayed.

10.2.31 UNI-Dix; <Text>

If one of the digital **UNIVERSAL INPUTS** is set to *"emergency switch-off", "switch-off"* or *"warning"* and if the **UNIVERSAL INPUT** is active for a longer period than has been set for the delay, this message is displayed.

10.2.32 UBatt ▼▼▼

The controller's buffer battery is empty and must be replaced (see chapter 10.3 Replacing the buffer battery).

10.2.33 Real-time clock error

The real-time clock module of the controller is defective; the controller must be replaced.

10.2.34 Watchdog error

The microcontroller of the controller is defective; the controller must be replaced.

10.2.35 KeyPad Error

One or several keys of the controller are defective; the controller must be replaced.

10.3 Replacing the buffer battery

The buffer battery is located on the board behind the display. It must be replaced if the controller displays UBatt ▼▼▼

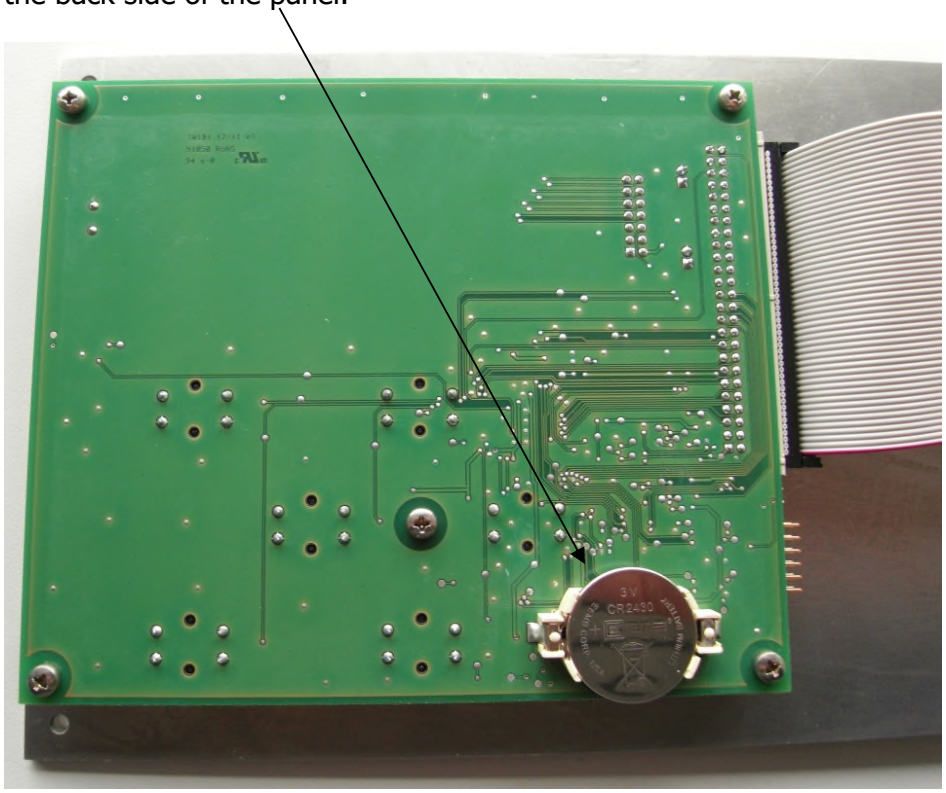
Note:

Make sure the controller is without voltage before replacing the battery:

- Top mount controller: switch off the controller at the power switch.
- Built-in controller: switch off the installation at the power switch.

10.3.1 Top mount controller

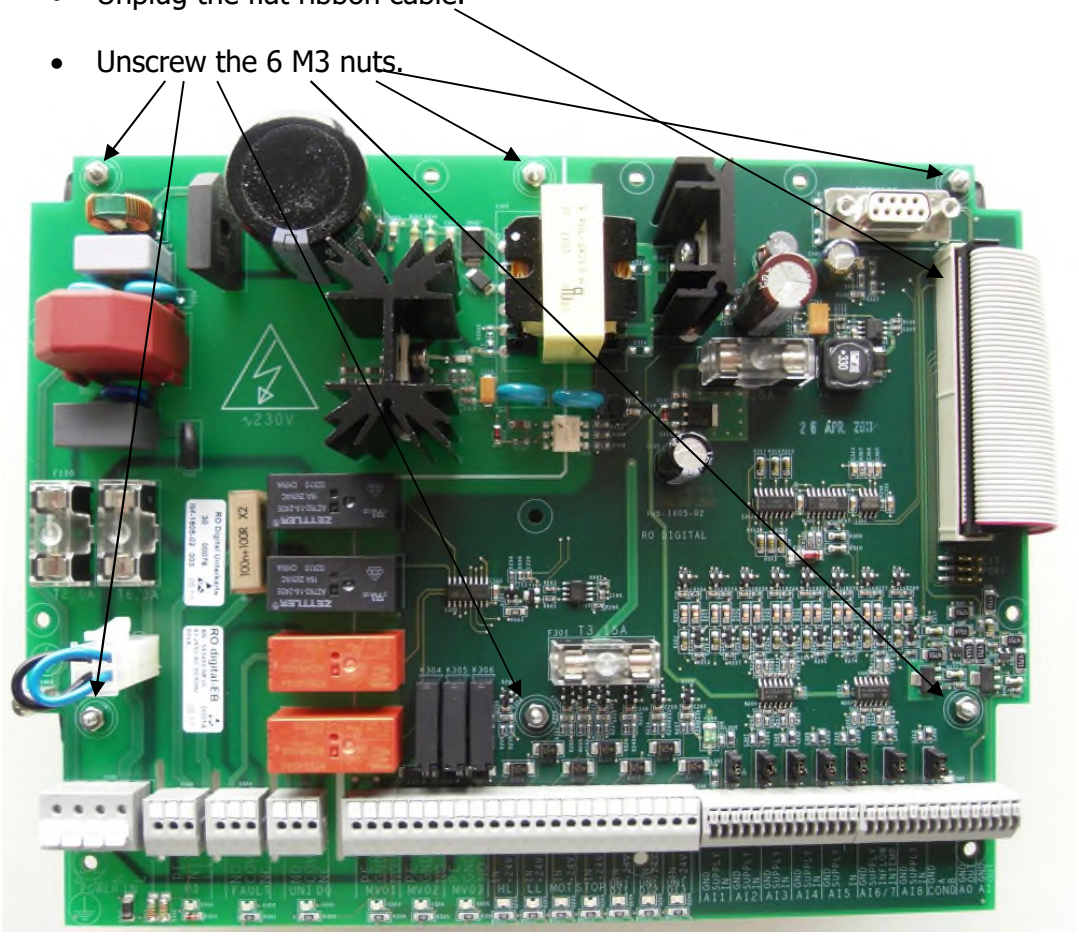
Unscrew the front panel in order to replace the battery (type CR 2430) which is located at the back side of the panel.



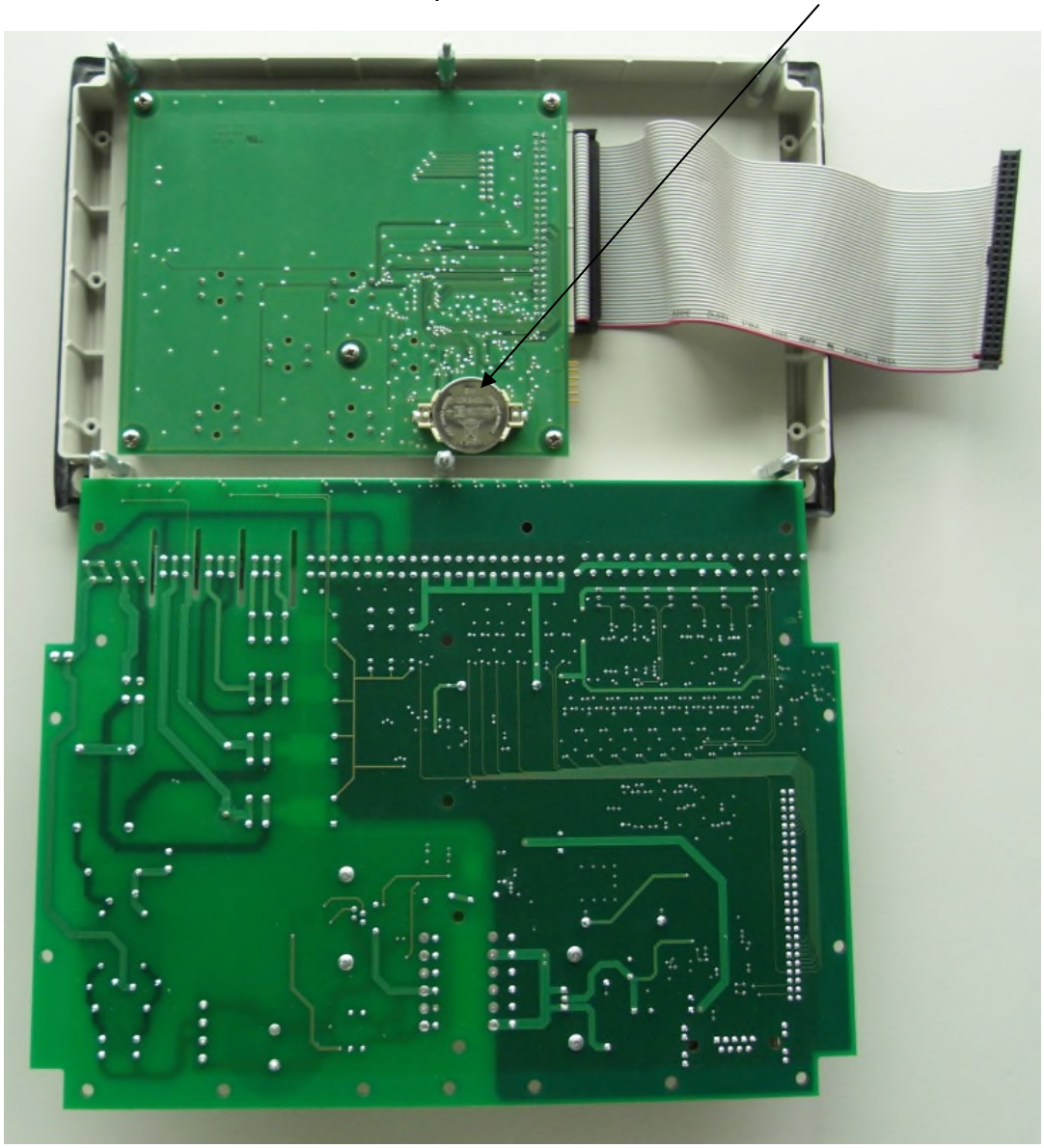
10.3.2 Built-in controller

Unscrew the I/O board in order to replace the battery

- Unplug the flat ribbon cable.
- Unscrew the 6 M3 nuts.



Remove the I/O board. The battery is located on the board beneath.



Having replaced the battery, screw the I/O board back in place and re-plug the flat ribbon cable.

11 Technical data

Housing	Built-in housing, top mount housing
Supply voltage	Wide range input 93 - 265 V; 50/60Hz
Fuses	- Electronics fuse (F101) 0.5 AT - Pump output fuse (F300) 6.3 AT - Digital outputs fuse (F301) 3.15 AT - PSU input fuse (F100) 2 AT
Protection	IP 65
Ambient temperature	0 – 45 °C (32 – 113°F)
Display	Text display 4 x 20 digits, backlit
Keypad	6 keys
LEDs	- Operation (green) - Fault (red)
Display languages	- 6 standard languages (D, D-Text, GB, GB-text, F, ESP) integrated
Terminals	Spring-loaded terminals: - 2.5 mm² for supply, outputs - 1.5 mm² for inputs - 0.5 mm² for analogous inputs
Interfaces	- RS232 interface as a 9 pin Sub-D terminal on the I/O board, galvanically isolated for diagnosis and servicing purposes - Port for another optional interface module for connection of a visualisation device, profinet, etc.
Voltage-free outputs	Change-over contact, max. 250V/ 4 A
Mains outputs	Pump, 230 V/ 5A inductive load NO contact to N NO contact to L
24VDC outputs	Permissible permanent load 0.5A, temporarily 150%
Analogue inputs	0.5 - 3.5 VDC or 0/4-20 mA Supply voltage 5 VDC ± 2.5% Separate change of the analogue inputs voltage supply from 5V to 24V for each I/O via jumper
Analogue outputs	4-20 mA, max. load 500 Ohm
Conductivity measuring range	1 to 1000 µS/cm
Operating temperature	0 to 45°C (32 – 113°F)

12 Disposal

Please consider local regulations!