

# Softmaster<sup>®</sup> ROE 1

**Microprocessor controllers for reverse osmosis plants**



Operating instructions

# Table of contents

<b>General notes</b> .....	<b>1</b>	Conductivity monitoring .....	17
Introduction .....	1	<b>Programming</b> .....	<b>18</b>
Handling notes .....	1	Start menu .....	18
Safety notes .....	1	Menu selection .....	18
Installation and commissioning .....	1	Input .....	18
<b>General description</b> .....	<b>2</b>	End menu .....	18
Views of device .....	2	Information menu .....	18
Description of display and operating features .....	3	Enter/Change password .....	18
<b>Display functions</b> .....	<b>4</b>	Flushing mode .....	19
Display - top line .....	4	Interval flush .....	19
Display - bottom line .....	4	Quality flush .....	19
LED displays .....	4	Probe CD Permeate .....	19
Status displays .....	5	LV Permeate Max. ....	19
<b>Error messages</b> .....	<b>5</b>	LV Permeate Min. ....	19
<b>Terminal block identification</b> .....	<b>8</b>	Temperature compensation .....	20
Functions .....	8	Function Low water pressure .....	20
<b>Description of relay outputs</b> .....	<b>10</b>	Function Excess pressure .....	20
PU, Pressure pump .....	10	Function IN 4-20 mA input .....	20
IV Input valve .....	10	Function Motor protection .....	21
FV Flush valve .....	10	Function Stop .....	21
PV Output valve .....	10	Function OUT DO/PV .....	21
DO Dosing output .....	11	Function Dosing .....	21
AL Fault message output ("Alarm") .....	11	Funktion OUT mA .....	21
<b>Description of signal inputs</b> .....	<b>11</b>	Release .....	22
LP Low water pressure .....	11	Language .....	22
HP/MP High water pressure/ Motor protection .....	12	<b>Service Menu</b> .....	<b>22</b>
HL und LL High and low level .....	13	Maintenance / Manuel flush .....	22
STOP Switching-off of the plant .....	13	Autom. flush .....	22
CD Connection for conductivity electrode .....	14	Error history .....	22
IN 4-20 mA Connection for pressure sensor .....	15	Calibration of conductivity sensor CD .....	23
PT100 Connection for temperature sensor PT100 .....	15	Operating hours .....	24
<b>OUT Interface-Output</b> .....	<b>15</b>	Pressure .....	24
<b>Functioning</b> .....	<b>16</b>	Time/Date .....	24
Switching on and power failure .....	16	Diagnosis .....	24
Production .....	16	Software status .....	24
Standby .....	16	<b>Menu structur overview</b> .....	<b>25</b>
Flush after production .....	16	<b>Technical appendix</b> .....	<b>26</b>
Interval flush .....	16	Example of an osmosis plant layout .....	26
Quality flush and emergency service .....	16	Connection example .....	26
		Technical data .....	27

# General notes

## Introduction

These operating instructions describe the installation, operation and programming of the reverse osmosis controller Softmaster ROE 1.

We recommend that, whilst familiarising yourself with the operation of the unit aided by this manual, you have immediate access to the operable controller in order to perform the functions and combinations as described. As certain functions are interrelated, it is advisable to follow the instructions in the given order.

Should problems or questions arise which are not described in this manual and/or cannot be solved, our customer service is always at your disposal.

Try to identify the problem as accurately as possible and record the conditions under which it occurred. This will enable us to offer you swift effective assistance.

## Handling notes

Quick, repeated switching on/off of the controller should be avoided. Wait at least 5 seconds before switching the unit either 'on' or 'off' at the main switch.

Only operate the controller in compliance with the ambient conditions (e.g. temperature, moisture) stated in the chapter entitled technical data. Especially protect the controller against moisture.

The controller should not come into contact with splash or condensation water.

Before dismantling a defect controller, always write down the description of the error (failure effect). Repair work (independent of the guarantee period) is only possible after the unit has been dismantled and returned to us with a description of the error.

The warranty shall not apply if the controller is tampered with, altered, modified or repaired contrary to the instructions described in this manual.

The allowed maximum electrical load capacity of the relay outputs and the total power rating of the plant must not be exceeded.

The controller should only be used for the stated intended purpose.

## Safety notes

Always pay attention to the following safety notes:

Only connect the device to the mains voltage displayed on the type plate. The controller must be installed and operated in compliance with the relevant standards (e.g. DIN, VDE, UVV), or in accordance with the regulations laid down by the individual country.

Some functions (e.g. manual production) allow direct manipulation of the plant (valves, pumps, etc.), without locking or monitoring. These functions are thus protected by a password and are only to be used by trained personnel.

If you observe malfunctioning of the controller, switch it off immediately and inform the service personnel.

Do not attempt to repair the controller yourself (loss of warranty rights); instead always get in touch with authorized service personnel. This is the only way a reliable and safe operation of the plant can be ensured.

After protective equipment (safety fuse, motor protection circuit breaker) has been triggered, attempt, at first, to eliminate the cause of the malfunctioning (e.g. clean the pump) before reactivating the protective equipment. Frequent triggering is always due to an error which, in certain circumstances, may also cause damage to the controller.

Ignoring these notes can result in damage to the controller as well as the plant and may result in a loss of warranty rights.

## Installation and commissioning

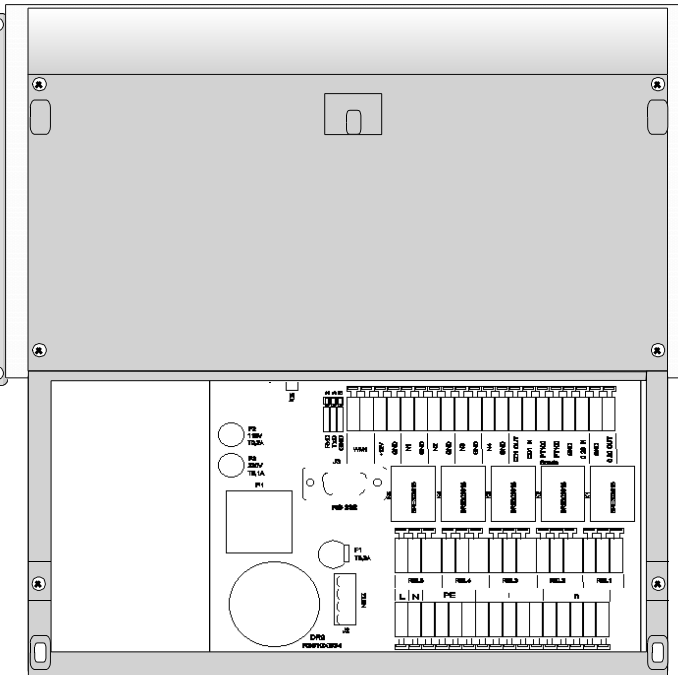
### **Installation as well as commissioning must only be undertaken by authorized technicians!**

The connecting cables to the sensors should be kept as short as possible and **clear** of power cables. Close proximity to strong electromagnetic radiators can lead to deviations of the display; in this case, separate interference suppression measures should be carried out.

After installation, program the unit with the plant-specific features and data (e.g. switch functions, conductivity limit values, etc.). The data is permanently stored (also during power failure).

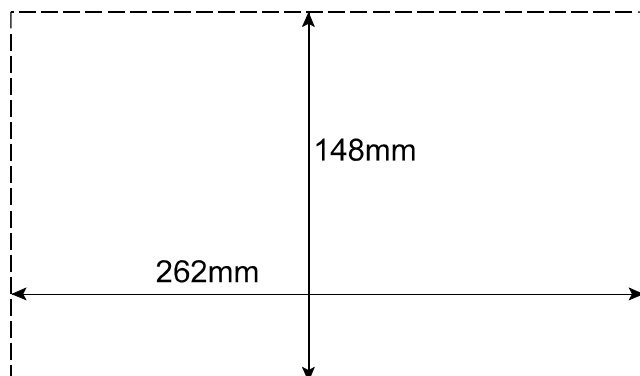
## Views of unit

### Panel-mounted variant

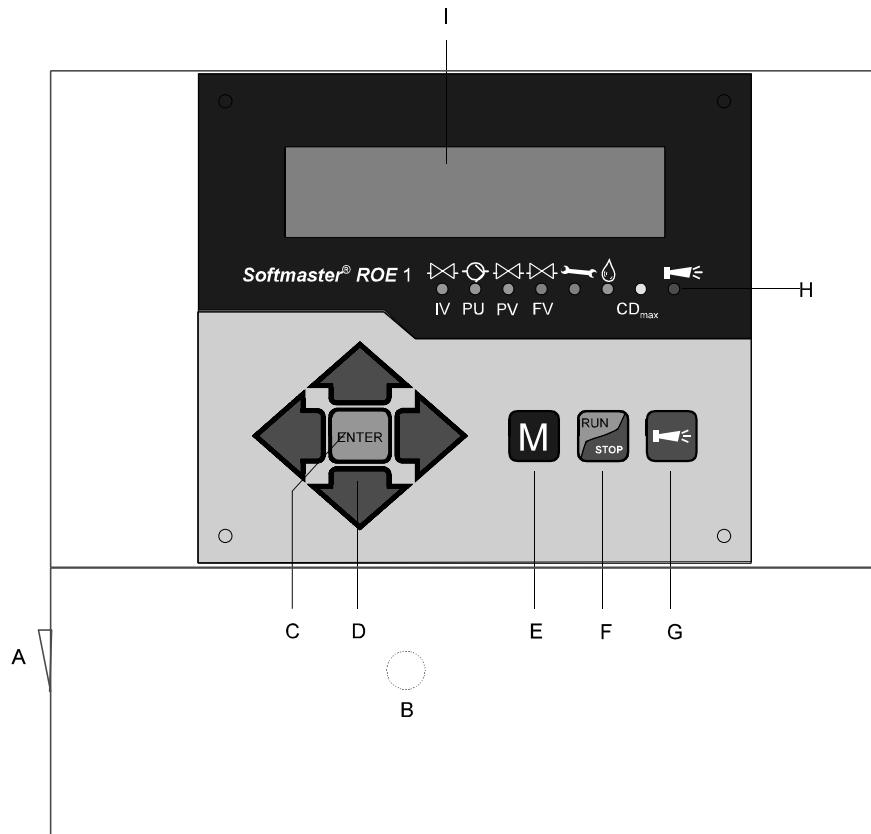


### Terminal box

### Panel cut-out for panel-mounted variant



## Description of display and operating features



### A On/Off switch

Only the wall-mounted variant is equipped with a On/Off switch. Use this switch to switch the unit on or off.

### B Safety fuse, max. T6.3A

The safety fuse protects the outputs against overload or a short circuit. (Inside the unit)

### C Thermal fuse (optional)

Thermal fuse protection for the pump motor, max. 6.3 A.

### D "ENTER" key

Confirm inputs and trigger functions with the ENTER key.

### E Arrow keys

Use these keys to operate the menu drive in the display and to enter values and programming data.

### F "M" key

Call the menu and return from submenu levels.

### G "Run/Stop" key ("Production/Standby")

Manual triggering of production: Plant is put into operation or manual triggering for STOP/ Standby: Plant goes into the Standby position.

### H "Fault OFF" key

Deletes the alarm signal at output 'AL' (Alarm); a fault display can only be deleted if the fault has been eliminated.

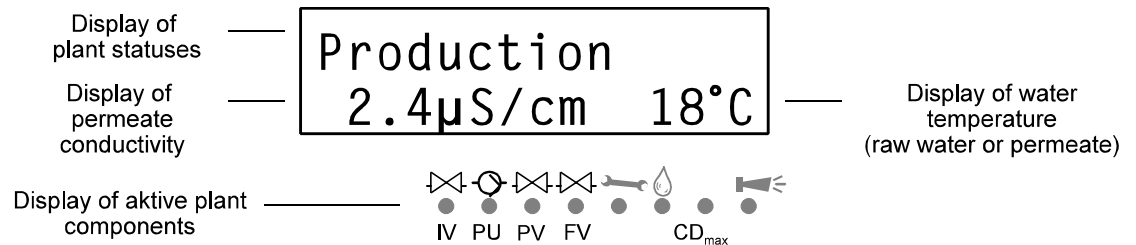
### I LED functions

LED symbols always signal the status of the plant, independent of the level (menu) being worked on.

### J LC display

Two lines, each line with 16 characters, backlit.

## Display functions



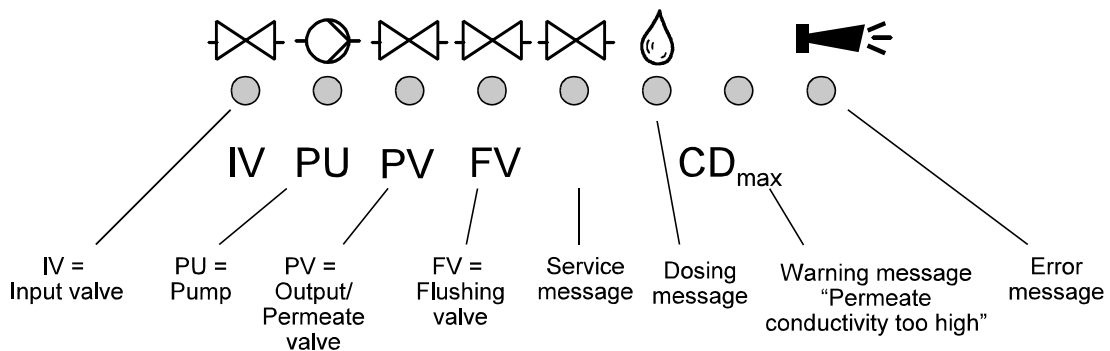
### Display - top line

The top line displays plant statuses and error messages (described below)

### Display - bottom line

The bottom line displays the conductivity (see technical data for measuring ranges) and water temperature (2-digit, only with automatic temperature compensation).

## LED-displays



The LEDs display active plant components and occurring error messages.

### IV (green)

LED lights up: Input valve is open.

### PU (green)

LED lights up: Pump is switched on.

### PV (green)

LED lights up: Output/Permeate valve is open.

### FV (green)

LED lights up: Flush valve is open.

### Maintenance message (green)

LED lights up: Manual flushing is active (SERVICE maintenance).

### Dosing message (green)

LED lights up as long as the dosing output is activated.

### Warning message "Conductivity too high" (yellow)

LED lights up: The limit value CD<sub>max</sub> has been exceeded.

### Error message "Alarm" (red)

LED lights up: Alarm relay has been activated, error message not confirmed yet and error still occurring.  
LED flashes: Alarm relay no longer active, error message has been confirmed but the error is still occurring.

As long as an error is still occurring, it is shown alternately with the operating display.

## Operating displays

Production 12.3µS/cm 21°C	Plant is in operation and produces permeate with 12.3µS/cm of conductivity at a water temperature of 21°C.
Standby 243µS/cm	Plant is on Standby with a permeate conductivity of 243µS/cm.
Flush 10m	Flush program is active (flush after production, interval flush or started manually), residual time 10 minute.
Program the duration of the quality flush in the BASIC PROGRAM menu.	
Quality Flush 197.3µS/cm	Quality flush during production is active with a permeate conductivity of 197.3µS/cm. The LED "CDmax" lights up additionally.
Program the duration of the quality flush in the BASIC PROGRAM menu.	
Maintenance 89m	Manual flushing is active with current residual operating time of 89 minutes. The LED "Maintenance" lights up additionally.
Stop	Plant has been stopped via the STOP input and is locked. It is only possible to restart production with the "Run/Stop" key after the stop input has been released.

## Error messages

**In addition to the displayed error messages, the red LED "Alarm" lights up or flashes.  
Alternate display of all error messages and operating displays.  
Each occurred error is stored in the error history.**

### Error message "Power failure"

Power failure	or	Power failure set clock !
---------------	----	------------------------------

Message after each switching on: "power failure". Acknowledge the fault display via the "Alarm" key. Check the time and, if necessary, set the time. After this, the unit is without a real-time clock (plug-in card RTC/RS232).

After switching on or after voltage recovery, the controller starts with "STANDBY". Check the plant for possible negative results due to the power failure.

All stored values remain stored even during power failure. The real-time clock is buffered and thus keeps running.

### Error message "CD Permeate Max"

CD Permeate Max  
64.4µS/cm

Permeate conductivity is greater than the set limit value "LV Permeate Max"

The maximum permeate conductivity has been exceeded for a longer period than the programmed test time (Delay Max) during production. The error message is displayed and, according to the programming, the plant has been switched off.

In addition to the error message, the yellow warning light "**CDmax**" lights up.

Acknowledge the fault display via the "Alarm" key.

Check the plant settings and raw water quality or check the units for possible defects.

The error display is only deleted once the fault has been eliminated.

---

### Error message "CD Permeate Min"

CD Permeate Min  
1.2µS/cm

Permeate conductivity is less than the set limit value "LV Permeate Min"

The minimum permeate conductivity has fallen below the limit value for a longer period than the programmed test time (Delay Min) during production. The error message is displayed and, according to the programming, the plant has been switched off.

Acknowledge the fault display via the "Alarm" key.

Check the conductivity sensor and its supply lines for interruption. There might be air in the permeate line and the sensor is not washed by water.

The error display is only deleted once the fault has been eliminated.

---

### Error message "Low water pressure"

Low water pressure  
16.8µS/cm    18°C

The pressure switch in front of the pressure pump for the dry-running protection has triggered.

The pressure switch in front of the pressure pump for the dry-running protection has triggered.

The plant has been switched off after the programmed delay time (Delay LP). Restart the plant via the "RUN/STOP" key. If water is still low, the plant is switched off again after the delay time.

When automatically controlling the re-filling of the storage tank, the plant is restarted 10 minutes after it was switched off via the dry-running switch.

Program the number of restart attempts after low water pressure under "Switch on" in the menu "Funct. low water pressure".

Acknowledge the fault display via the "Alarm" key.

The error display is only deleted once the fault has been eliminated.

---

### Error message "Excess pressure"

Excess pressure  
16.8µS/cm    18°C

The pressure switch behind the pressure pump for the protection of the units against excess pressure has triggered.

The plant has been switched off after the programmed delay time (Delay HP). Restart the plant via the "RUN/STOP" key. If renewed excess pressure occurs, the plant is switched off again after the delay time.

Acknowledge the fault display via the "Alarm" key.

The error display is only deleted once the fault has been eliminated.

---



**Error message "Motor protection"** (only if input HP/MP has been programmed as motor protection input)

Motor protection 16.8µS/cm    18°C
---------------------------------------

The motor protection circuit breaker of the pressure pump has triggered.

After triggering the protective switch, the plant has been switched off immediately. Restart the plant via the "RUN/STOP" key if the motor protection has been re-released.

Acknowledge the fault display via the "Alarm" key.

The error display is only deleted once the fault has been eliminated.

---

**Error message "Excess quality flushing duration has been exceeded"**

Max. Q-flush time 196.2µS/cm    18°C
---

Even after a quality flush, the permeate conductivity is still greater than the set limit value "LV Permeate Max".

The error message is displayed and emergency service starts.

In addition to the error message, the yellow warning light "**CDmax**" lights up.

Acknowledge the fault display via the "Alarm" key.

Check the plant settings and raw water quality or check the units for possible defects.

The error display is only deleted once the fault has been eliminated.

---

**Error message "Temperature low"**

Temperatur low 16.8µS/cm    0°C
------------------------------------

The water temperature is lower than 1° C.

The water temperature during production has fallen below the minimum water temperature.

Check whether short circuiting has occurred in the sensor or the temperature sensor PT100 or in their supply lines.

Acknowledge the fault display via the "Alarm" key.

The error display is only deleted once the fault (temperature > 2° C ) has been eliminated.

---

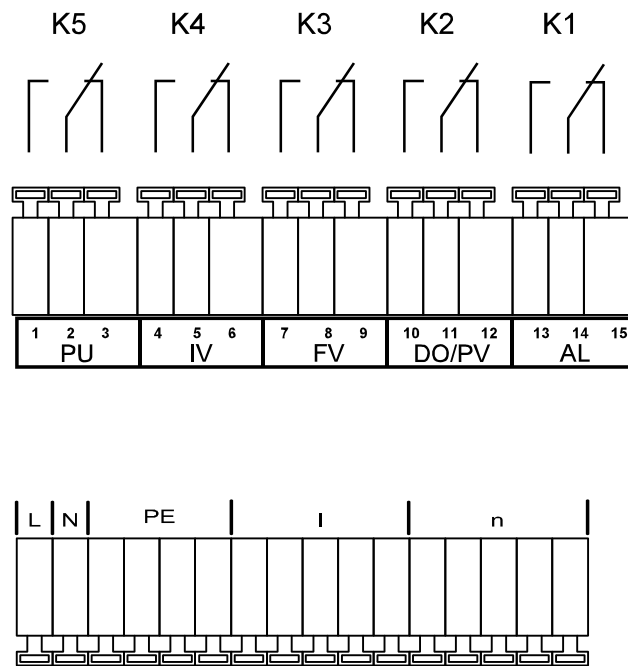
## Terminal block identification

**Functions** (IN = input, OUT = output)

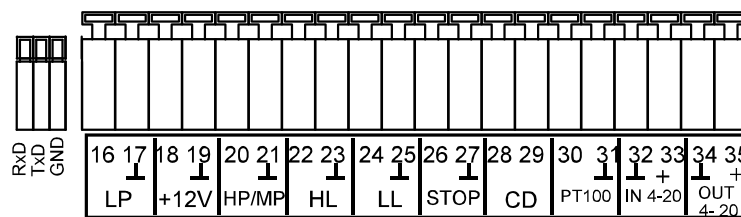
No	Terminal	Type	Function	Note
	PE	IN	4x Mais-Protective earth	
	L N	IN	Mains, N = Neutral Mains, L = Live	Mains-input 230 - 240 V AC
	I n	OUT	5x Neutral switched 5x Live switched	Mains voltage, max. 6 A
1 2 3	PU	OUT	Pump - Normally open Pump - Common Pump - Normally closed	Volt-free relay output max. load 240 V AC, 6 A
4 5 6	IV	OUT	Input valve - Normally open Input valve - Common Input valve - Normally closed	Volt-free relay output max. load 240 V AC, 6 A
7 8 9	FV	OUT	Flush valve - Normally open Flush valve - Common Flush valve - Normally closed	Volt-free relay output max. load 240 V AC, 6 A
10 11 12	DO/PV	OUT	Dosierung/Ausgangsventil - Normally open Dosierung/Ausgangsventil - Common Dosierung/Ausgangsventil - Normally closed	Volt-free relay output max. load 240 V AC, 6 A
13 14 15	AL	OUT	Fault message output - Normally open Fault message output - Common Fault message output - Normally closed	Volt-free relay output max. load 240 V AC, 6 A
16 17	LP ⊥	IN	Low water messages common loads for inputs	Only for volt-free normally open/normally closed contact!
18 19	+12V ⊥	IN	12V-supply for turbine common load for inputs	See water meter description!
20 21	HP/MP ⊥	IN	Overpressur message/ext. motor protection common load for inputs	Only for volt-free normally open/normally closed contact!
22 23	HL ⊥	IN	Storage tank FULL common load for inputs	Only for volt-free normally open/normally closed contact!
24 25	LL ⊥	IN	Storage tank EMPTY common load for inputs	Only for volt-free normally open/normally closed contact!
26 27	STOP ⊥	IN	Stop plant common load for inputs	Only for volt-free normally open/normally closed contact!
28 29	CD	IN	Conductivity electrode for permeate	
30 31	PT100	IN	Temperature sensor PT100	Water temperature (permeate or raw water)
32 33	⊥ IN 4-20mA	IN	common load Signal pressure sensor (optional)	4-20mA-input, see pressure input description
34 35	OUT 0-20mA - OUT 0-20mA +	OUT	Current interface 0/4-20mA (standard)	- indirect-coupled

No.	Terminal	Type	Function	Note
36	RxD	IN/ OUT	Serial interface RS232, RxD	Parallel to D-SUB-plug RS-232 (J3)
37	TxD		Serial interface RS232, TxD	
38	GND		Serial interface RS232, Masse	

## Terminal blocks for mains supply and relay outputs (displayed relay position: Device deenergized)



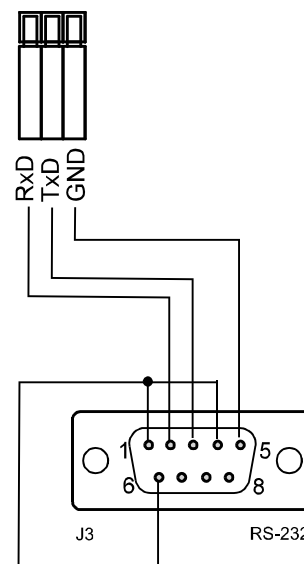
## Terminal blocks for inputs and interface



## Serial interface RS232

PIN 2 - RxD  
 PIN 3 - TxD  
 PIN 4 - DSR, DTR (not used)  
 PIN 5 - GND, Masse

**Please observe that the peripheral devices are connected via a neutral modem cable!**



Internal used!

## Description of relay outputs

### PU, pressure pump

The pressure pump of the osmosis plant can be switched directly. Fuse protection occurs internally via a safety fuse T6.3A. When using a three-phase motor, an appropriate power protection contactor has to be pre-connected. The input valve always opens when switching to production. The pressure pump starts after a 10 second delay.

Select whether flushing should occur via a pump under menu option:

"M" → BASIC PROGRAM → FLUSH → w.pump.

If the pump is equipped with a motor protection circuit breaker with a volt-free message contact, it is possible to connect it to input "MP". Activate the input in the menu. The controller will then monitor pump faults (see description of input MP motor protection).

### IV, input valve

The input valve is open during "Production", "Quality flush" and "Flush". It should be designed in a way to ensure that it opens under control voltage. Use the following menu option to program that the input valve is closed during flush:

"M" → BASICPROGRAM → FLUSH → w. valve IV

### FV, flush valve

The osmosis plant can be equipped with a flush valve in order to avoid unacceptable high deposits at the units. Flushing can take place after "Production" and/or at fixed intervals after the last switching to the "Standby" position.

Interval flush prevents unacceptable bacterial contamination of the units.

Flushing is interrupted as soon as the controller switches to "Production", e.g. when pressing the "Production" key or if water is requested via a level transmitter in the storage tank.

No interval flush occurs after production stop.

Program the flushing duration (0 - 99 minutes), flushing mode (with/without pump or with/without input valve) and the flush interval in the basic program.

"M" → BASIC PROGRAMM → FLUSHING oder INTERVAL FLUSH → Dauer

### PV, Output valve (Permeate valve)

#### Only if output DO/PV has been programmed as PV !

This valve is open as long as the water conductivity is below the set limit value "LV Permeate Max". A flush valve which closes under voltage can be connected instead of the output valve. The use of both valves or of a 3/2-way valve is also possible.

Use the following menu option to program if you wish to use an output valve:

"M" → BASIC PROGRAM → FCT. OUT DO/PV → Output valve PV

## DO, dosing output

### Only if output DO/PV has been programmed as DO !

Use the output DO to control a dosing pump if an anti-scaling medium is to be dosed during production or flush. The impulse ratio is adjustable.

Use the following menu option to program if you wish to use an output valve:

"M" → BASIC PROGRAM → FCT. OUT DO/PV → Dosing DO

Example:

10-second impulses and a 10-second pause should occur during production:

"M" → Basic program → Dosing → Production

"M" → Basic program → Dosing → I. lenght 10s

"M" → Basic program → Dosing → I. pause 10s

### AL, fault message output ("Alarm")

The output "AL" is a volt-free change-over relay contact. During trouble-free operation the contact between the terminals 13 – 14 is closed and the one between terminals 14– 15 is open. In case of power failure or a fault, the contact between the terminals 14 – 15 is closed and the one between terminals 13– 14 is open.

The controller monitors a whole range of plant statuses. The "AL" output remains activated (terminals 14 – 15 closed) as long as the fault persists.

The red LED "Error message" and the text on the display indicate a fault.

The fault message signal at the "AL" output is deleted by confirming the fault via the "Horn" key.

The fault display can only be deleted once the fault has been eliminated.

The following faults activate the "AL" output and are displayed if you have equipped the osmosis plant with the respective sensors:

The following statuses **always** trigger a fault message:

Power failure

Low water level LP (after switching off)

Max. Q flush time has been exceeded

Min. conductivity not achieved

Max. conductivity has been exceeded

Cond. measuring range not achieved

Max. water temperature exceeded

Min. water temperature not achieved

Max. pressure exceeded

According to programmed HP/MP input:

Motor protection MP or

overpressure HP

See page 22 for further descriptions of error messages and programming.

## Description of the signal inputs

### Note

Only connect the signal inputs "LP", "HL", "LL", "HP/MP", "STOP" to **volt-free** contacts!

### LP, low water level

Connection for volt-free pressure switch

Function	Type of contact	Test time	Action
Pressure monitoring in front of the pump	programmable normally closed/ normally open	programmable 01 - 99 seconds	programmable - Restart up to 9 x <b>Not</b> programmable - Switching off the plant - Continuous alarm after switch off - Entry in error list

Install a maximum pressure governor in front of the pump to protect the pressure pump. A serial or parallel connection of two maximum pressure governors is also possible.

If the maximum pressure governor switches, the plant is switched off after a programmable test time. The fault is displayed via the red LED "Error message" and on the display. A continuous alarm occurs at output "Alarm" and the fault is entered in the error list.

"M" → Basic programm → Fct. Low water level

It is possible to program the reaction of the controller during low water. Determine how often the plant is to be restarted. Restart occurs after 10 minutes (fixed). If the water is still too low, the plant is once again switched off after the test time and until the number of restarts has been reached.

#### Note!

When operating the osmosis plant without a pressure governor for low water identification, the connection "LP" has to be bridged or programmed as normally open.

### HP/MP, excess pressure/Motor protection

Use this input for connecting a maximum pressure governor or monitoring the pressure pump. Program the required function in the menu.

#### MP, Motor protection

If you are using pumps equipped with a motor protection circuit breaker with a volt-free message contact, it is possible to connect it to input "MP". Please program the operating mode of the message contact accordingly.

A pump fault is then monitored and evaluated by the controller.

"M" → Basic programm → Fct. Motor protection → ON

Function	Type of contacts	Test time	Action
– Message contact of an external motor protection circuit breaker	programmable normally closed/normally open	2 seconds	– Switch off – Continuous alarm – Entry in error list

#### HP, overpressure

Connection for volt-free pressure switch

"M" → Basic programm → Fct. Overpressure → Contact HP/MP

Function	Type of Contact	Test time	Action
Monitoring of the pressure in front of or behind the unit programmable	normally closed/ normally open	programmable 01 - 99 seconds	– Switching off the plant – Continuous alarm – Entry in error list

Install a maximum pressure governor either at the raw water side or at the concentrate side in order to protect the unit. A serial or parallel connection of two maximum pressure governors is also possible.

If the pressure governor switches, the plant is switched off after a programmable test time. The red LED "Error message" and the text on the display indicate the fault. A continuous alarm occurs at output "Alarm" and an entry in the error list occurs.

Restart the plant via the "RUN/STOP" key. If excess pressure still occurs, the plant is switched off again after the test time.

#### Note!

When operating the osmosis plant without a maximum pressure governor, the connection "HP" has to be bridged and programmed as normally open or "MP" input.

## HL and LL, full- and empty level

Connections for volt-free contacts

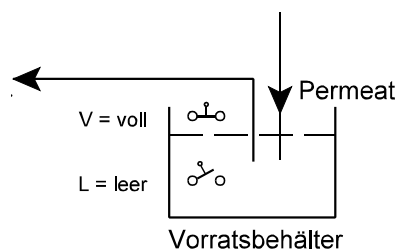
Funktion	Art des Kontakts	Prüfzeit	Aktion
<b>HL</b> – Level transmitter input "Full level" – Pressure switch input	Normally closed	2 seconds	– Stop production (when a full level transmitter has been connected) – Start production (if a pressure switch has been connected)
<b>LL</b> – Level transmitter input Eingang "Leer-Niveau"	Normally open	2 second	– Start production (when an empty level transmitter has been connected)

You can use the connections "HL" and "LL" for controlling the production:

a) For plants with a storage tank:

Once the low level "Tank empty" ("LL" connection) has been reached, the contactor closes and the plant is switched on ("Production"). It is only switched off again once the upper level "Tank Full" ("HL" connection) has been reached and this contactor is opened.

Instead of two level transmitters it is also possible to operate with just one upper level transmitter (floating switch) or a remote switch (Production/Standby). Connection "LL" then has to be connected to "2" via a bridge. The "Run / Stop" key ("Production / Standby") will then be without function.



### Note!

When using automatic concentrate displacement via permeate (flush), observe that, depending on the pressure ratios, soft water can still run into the storage tank until the end of the flushing duration. Due to this, the upper level transmitter has to be arranged in a way that a tank overflow is avoided. For safety reasons, the tank should have a tank overflow to the drain.

It is possible to install a level transmitter above the "Full level" in order to switch off the plant in case of a tank overflow. Connect this switch to the signal input "STOP". The plant automatically switches off if the "Tank overflow level" has been reached.

### Note!

When operating the osmosis plant without a level transmitter (manual operation), a bridge has to be connected across the connection "HL". A bridging of the connection "LL" is **not** allowed.

b) For plants with one pressure switch or remote control switch:

Connect a bridge to the connection "LL" and the pressure switch to the connection "HL". The pressure switch must have a normally closed contact.

## STOP, Switching off the plant

Connection for volt-free contact

Function	Type of Contact	Test time	Action
External switching off the plant	programmable normally closed/ normally open	programmable 01 - 99 Seconds	– Switching off the plant

During production, it might be necessary to interrupt the production externally via a switch. In the case of pre-connected single filter plants, the osmosis plant should not switch to "Production" during regeneration in order to avoid operation of the units with hard water.

Interval flush is suppressed via the function "STOP".

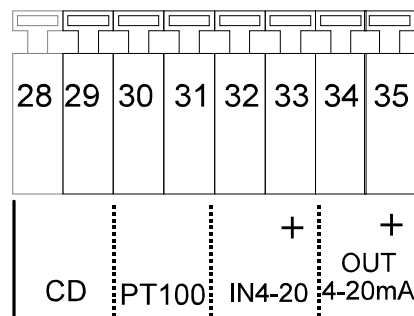
If the input is activated (as normally closed or normally open), the plant switches off (display "Stop").

"M" → Basic programm → Fct. Stop

## CD, Connection for conductivity sensor

The unit is equipped with a measuring amplifier for conductivity measurement  
The conductivity sensor at connection CD measures and monitors the permeate conductivity  
Different measuring ranges arise due to the connection of sensors with varying cell constants

Terminal block identification:



Measuring range	Cell constant	Sensor name, e.g.
0,01 - 19,99 µS/cm	0,01 cm <sup>-1</sup>	SOE0, STE0 PT100
0,1 - 999,9 µS/cm	0,1 cm <sup>-1</sup>	SO1, ST1 PT100, SOE1
0,5 - 4999 µS/cm	0,5 cm <sup>-1</sup>	SO5, SOE5, ST5 PT100
1 - 9999 µS/cm	1,0 cm <sup>-1</sup>	SD10, SO10
5 µS/cm -49,99 mS/cm	5,0 cm <sup>-1</sup>	STE50 PT100

If the measuring range is exceeded, "OFL" appears in the conductivity display and the error message "Exceed range CD" is additionally displayed.

Program the used cell constant of the permeate monitoring under:

"M" → Basic programm → Sensor Permeate

It is possible to use deviating cell constants by calibrating the sensor with a conductivity calibration solvent. Use "dry" or zero point calibration to balance measured value distortions due to cable capacities. For this task, please observe the description about calibration.

See the function description "conductivity monitoring" for information about the functionality of the limit values.

## IN 4-20mA, Input for pressure sensor

The pump pressure in front of the unit is measured via a pressure transmitter at connection "IN 4-20mA".  
Only use sensors with a 4-20mA output signal.

If you wish to activate overpressure monitoring, please select output "IN mA" under "Fct. overpressure".

It is possible to program the measuring range of the used pressure transmitter:

"M" → Basic programm → Fct. IN 4-20mA → max. pressure

It is possible to program the limit value for overpressure monitoring:

"M" → Basic programm → Fct. IN 4-20mA → LV pressure

The current pressure can be requested in the service menu:

"M" → Service → Pressure



### PT100, Connection for temperature sensor PT100

Function	Connection	Test time	Action
Temperature compensation	PT100, integrated in sensor or external	none	Temperature compensation factor programmable 0.1 - 9.9%/°C
Temperature monitoring	PT100, integrated in sensor or external	none	At temperature < 1°C: – Continuous alarm – Entry in error list

Both functions can be used simultaneously.

Please connect a **temperature sensor PT100** to the input "PT100" if automatic temperature compensation (of the conductivity) is to be used; preferably use a conductivity sensor with integrated PT100. It is also possible to use a separate temperature sensor, but it has to be installed near the conductivity sensor.

"M" → Basic programm → Temp.-comp.

### OUT 0/4-20mA, Interface output (Terminals 34 - 35)

Function	Connection	Test time	Action
Current interface 0/4 - 20 mA	Load max. 500 Ohm	-	- Conductivity Permeat 0-20mA oder 4-20mA

It is possible to change the output function in the menu:

"M" → Basic programm → Fct OUT mA

## Functions characteristics

### Switching on and power failure

After switching on the instrument and after each power failure, the plant automatically returns to the Standby position. Prior to the Standby position another flush takes place according to the programmed flushing duration (see programming). The plant can either be switched on manually by pressing the "RUN/STOP" key ("Production/Standby") or automatically, e.g. via existing level transmitters in the storage tank.

### Production / Run

Use the "RUN/STOP" ("Production/Standby") key to switch on the pressure pump of the osmosis plant. The control lamp "Pump" ("PU") lights up, the input valve opens and after a delay time the motor of the pressure pump starts. During production it is possible to monitor the raw water pressure in front of the pressure pump (dry-running protection) as well as the pressure behind the pressure pump (overpressure protection) via pressure switches if the plant is equipped with the appropriate sensors. Additionally, the permeate conductivity is measured, displayed and compared with a minimum and maximum limit value.

The switching on and off can also take place automatically via level transmitters in the storage tank if the osmosis plant is equipped with a storage tank.

It is possible to interrupt the production temporarily via an external switch (input "STOP") in order to, e.g., regenerate a pre-connected softening plant.

### Standby

Press the "RUN/STOP" ("Production/Standby") key if water is no longer required. The pressure pump is switched off and the display shows "Standby". The switching on and off can also take place automatically via level transmitters in the storage tank if the osmosis plant is equipped with a storage tank. In the case of plants with a flush valve, there is a re-rinsing phase (flush after production) prior to the position "Standby". During this time, "Flush" is shown on the display and the control lamp "flush valve" ("FV") lights up.

When switching from production to flush, the pressure pump is - with opened input and flush valve - switched off for 5 seconds in order to achieve a pressure compensation of the plant.

The water pressure in front of and behind the pressure pump, the concentrate flow as well as the conductivity limit values are not monitored in "Standby".

### Flush after production

The osmosis plant can be equipped with a flush valve (connection "FV") in order to avoid unacceptable high deposits at the units. Flush is started after the end of production if the storage tank is filled or by pressing the "RUN/STOP" ("Production/Standby") key. Program the necessary flushing duration in the basic program under "Flushing duration".

Please set the flushing duration to 0 minutes if no flush is to take place after production.

Flushing is cancelled as soon as the "RUN/STOP" ("Production/Standby") key is pressed or if water is requested via a limit transmitter in the storage tank.

### Interval flush

After the last switch off (in Standby), flushing can occur at fixed intervals. Interval flush prevents unacceptable bacterial contamination of the units. Enter the interval time (0 - 999 hours) and the flushing duration (1 - 99 minutes) in the basic program ("Interval flush").

Flushing is cancelled as soon as the "RUN/STOP" ("Production/Standby") key is pressed or if water is requested via a limit transmitter in the storage tank.

No interval flush occurs after production stop.

### Quality flush and emergency service

During production, it is checked whether the permeate conductivity rises above the upper limit value (LV Permeate Max). If it is too high and **quality flush** (Quality flush: ON) has been programmed, but not if conductivity is too high (LV Permeate Max: Switch off), a quality flush is started for the programmed duration after the end of the set test time for the upper limit value.

It is switched back to production if the permeate conductivity falls again due to the flush. However, if the permeate conductivity remains too high, the **emergency service** starts after the quality flush. The storage tank is filled in spite of the excessive conductivity. The emergency service is not shown extra on the display (display: "Production").

The emergency service is terminated as soon as the conductivity falls below the upper limit value.

## Conductivity monitoring

The integrated conductivity measuring instrument is used for the quality monitoring of the plant.

**"OFL" appears on the display if the measuring range is exceeded.**

Temperature compensation of the conductivity can either take place automatically or manually with a programmable compensation factor. Sensors with PT100 temperature sensors (or external sensors) have to be used for the automatic compensation. In the case of manual compensation (suitable with constant water temperature), enter the temperature. See "Description of the inputs: PT100" for further explanations.

### Description of the functionality and programming of the conductivity limit values:

**LV Permeate Max:** Maximum conductivity value which should guarantee sufficient water quality.

"M" → BASIC PROGRAMM → LV Permeat Max

**LV Permeate Min:** Minimum conductivity value which is necessary due to the existing raw water quality But if conductivity does fall below this value, there is an error in the plant or the controller is present (e.g. in the case of an interruption between controller and measuring sensor = parting of a cable).

"M" → BASIC PROGRAMM → LV Permeat Min

The functionality of the limit values is stated in the table below:

Limit value	Test time	Action
LV Permeat Min <b>fallen below</b>	programmable 1 - 99 seconds	<ul style="list-style-type: none"><li>– Continuous alarm</li><li>– Entry in error list</li><li>programmable</li><li>– Switching off the plant</li></ul>
LV Permeat Max <b>exceeded</b>	programmable 1 - 99 minutes	<ul style="list-style-type: none"><li>– LED display "CDmax" lights up</li><li>– Continuous alarm</li><li>– Entry in error list</li><li>programmable</li><li>– Switching off the plant</li></ul>

# Programming

## Menu start

Use the "M" key to open the menu.

## Menu selection / Selection

The current line position is displayed as a header in CAPITAL LETTERS. Use the "ENTER" key to activate the selected/displayed menu item, i.e. you "jump" into a submenu. The next menu item is called via the "DOWN" arrow key: You can "scroll" the menu.

## Input

### Inputs are only possible in the BASIC PROGRAMM menu and in certain SERVICE menu items.

Select a programming step via the arrow keys "DOWN" and "UP" and activate the input function by pressing the "ENTER" key.

The first digit/position to be changed flashes when entering digits.

Use the arrow keys "Right" and "Left" to change to the next or previous digit (now flashing).

Use the arrow keys "DOWN" and "UP" to change the value or the selection.

With selection options, selected functions are labelled with a T.

Exit the input function via the "ENTER" key.

Use the "M" key to go to the superordinate menu.

"M"



MENU
Service
Information
Basic program

## Menu end

Use the "M" key to jump to the superordinate menu. After returning from the highest menu level, the unit is in display mode again. The controller returns to the normal operating display (automatic menu end) if no key is pressed in the menu during a 2-minute period.

## Informations-Menü

"M" → Information

In the information menu it is possible to request the current settings without entering a password. The information menu is still displayed even if an incorrect password has been entered.

## Programming

"M" → Basic programm

### Enter Password

The programming menu is protected by a 3-digit password (number between 000 and 999) in order to prevent unauthorised access to the programming.

Enter the password under

"M" → Basic programm → Password entry and confirm the the entry via the "ENTER" key.

You are now in the **BASIC PROGRAMM** menu

BASIC PROGRAM
Password input
Password change

### Change password

Enter or change your individual password at any time.

To achieve this, enter the old password (OLD: ) and then the new one (NEW: ).

## Flush

It is possible to select and combine the units which are to be activated during flush as desired:

With/without pump,

With/without input valve IV.

Also enter the desired duration for the re-rinsing (also see "Flush after production").

The flush valve FV is generally active for the duration of the flush.

FLUSHING MODE	
with pump	✓
with valve IV	✓
Duration	10m

## Interval Flush

Enter the interval for the automatic flush during standstill of the plant in hours and the desired duration in minutes.

There is no interval flush if 0 hours is entered.

The components selected under "Flushing" as well as the flush valve FV are active during interval flush.

INTERVAL FLUSH	
Interval	90h
Duration	2m

## Quality flush

Depending on the permeate conductivity (quality), it is possible to start a flush during production. If the limit value LV Permeate Max is exceeded, the unit is flushed for the entered duration.

QUALITY FLUSH	
On	
Durat. max	5m

## Sensor CD Permeat

Program the cell constant C of the used conductivity sensor:

(Possible values: 0.01 – 5.0/cm)

PROBE CD PERMEAT	
C =	1.00/cm

## LV Permeat Max., Maximum limit value permeate conductivity

### Max.:

Enter the maximum conductivity which should guarantee sufficient water quality.

### Delay Max.

Delay time in minutes after which an alarm is triggered and/or the plant should be switched off if the maximum limit value has been exceeded.

### Switch off

Program "Switch off" if the plant should be switched off after the end of the delay time if the maximum limit value has been exceeded.

## LV Permeat Min., Minimum limit value permeate conductivity

### Min.:

Minimum conductivity value which is necessary due to the existing raw water quality. If the conductivity falls below this value, an error in the plant or the controller is present.

### Delay Min.

Delay time in seconds after which an alarm is triggered and/or the plant should be switched off if the value has fallen below the minimum limit value.

### Switch off

Program "Switch off" if the plant should be switched off after the end of the delay time if the value has fallen below the minimum limit value.

LV PERMEAT MIN	
Min.:	1.0µS/cm
Delay Min	20s
Switch off	✓

## Temperature compensation

### Automatic/manuell

Please connect a **temperature sensor PT100** to the connection "PT100" and program automatic compensation if the temperature compensation of the conductivity should occur automatically.

TEMP.-COMPENS.	
automatic	-
manual	✓
Factor	2.0
Temp.	2°C

### Factor (temperature coefficient in %/°C)

Enter the temperature compensation factor of the medium to be measured. The value for natural water is approx. 2%/°C. Use reference measurements to determine the temperature coefficient for ultra pure water and with very small conductivities:

First, program the factor to 1.0 and measure the conductivity and the temperature of the medium at a temperature T1. Then measure the same medium at a temperature T2. Use the following formula to calculate the factor:

$$\text{Factor} = \frac{((\text{Conductivity}(T1) / (\text{Conductivity}(T2)) - 1))}{(T1 - T2)}$$

### Temperature

Please enter the existing water temperature for the manual compensation

## Funktion Low water pressure, Input low water pressure monitoring LP

Program the desired effect of the connected contact for low pressure monitoring, normally closed or normally open.

FCT.LOW W.PRESS	
norm. closed	-
norm. open	✓
Delay LP	5s
Restart	3x

### Delay LP

Delay time in seconds after which an alarm is triggered and/or the plant should be switched off if the water/pressure is low.

### Restart

Program how often the plant is to be switched on again after the switch off caused by low water pressure. The plant can be re-started up to 9 times until the final switch off.

## Funktion Excess pressure,

Input excess pressure monitoring HP or 4-20mA signal of the pressure transmitter.

Program the used signal input, the desired effect of the connected contact for monitoring the pressure pump and the delay time.

FCT.EXC. PRESS.	
IN mA	-
Contact HP/MP	✓
norm. closed	-
norm. open	✓
Delay HP	10s

### Delay HP

Delay time in seconds after which an alarm is triggered and/or the plant should be switched off if the pressure is too high.

## Function IN 0/4-20mA input

Program the measuring range of the sensor and the limit value for monitoring excess pressure if the osmosis plant is equipped with a pressure measuring transducer for the measurement of the pump pressure:

FCT. IN 4-20mA	
max.press.20bar	
LV HP:	3.0bar

Request the current pressure in the SERVICE menu, e.g.:

"M" → Service → Pressure 14.3bar

## Function Motor protection, Input motor protection monitoring MP

Program the activation and the desired effect of the connected contact for monitoring the driving motor of the pressure pump.

**The 2-second delay time after which an alarm is triggered and the pump is switched off is predetermined and cannot be changed.**

FCT.MOTOR PROT.	
ON	—
norm. closed	
norm. open	✓

## Function Stop, Stop input

Program the desired effect of the connected contact for the switch off of the plant, normally closed or normally open.

### Delay Stop

Delay time in seconds after which the plant should be switched off.

FCT. STOP	
norm. closed	
norm. open	✓
Delay Stop	1s

## Function OUT DO/PV, Output Dosing or permeate valve

### DO dosing

If you wish to dose during operation, use output DO/PV as the impulse output for controlling a dosing pump.

### PV output valve (permeate valve)

As an alternative, you can use the output to control a permeate valve. This valve is open as long as the water conductivity is below the set limit value "LV Permeate Max". A flush valve which closes under voltage can be connected instead of the output valve. The use of both valves or of a 3/2-way valve is also possible.

FCT. OUT DO/PV	
Dosing DO	—
Output-V. PV	✓

## Dosing

**Only possible if output DO/PV has been programmed as dosing output !**

(If dosing has not been programmed, "no dosing" is displayed!).

Program the operating position of the plant during which dosing is to take place, the impulse pause and impulse length.

Please observe:

Relays mechanically possess a max. of  $10 \times 10^6$  switching cycles

DOSING	
Flush	✓
Production	✓
I.Pause	1s
I.Duration	1s

## Function OUT mA

Program the current range of the installed current interface according to its use.

FCT. OUT mA	
0–20mA	✓
4–20mA	—

## Language

Selection of the desired language for the display:

Four "standard" languages are currently available. If desired other language versions are also possible.

LANGUAGE	
German	✓
English	
French	
Italian	
Polish	

---

## "SERVICE" Menu

Request and change current settings and statuses of the instrument in the Service menu.

### Maintenance (manual flush)

Start a flush of the plant via this manual function. After the start a return to the operating display occurs. The maximum flushing duration is limited to 99 minutes. End the maintenance with the "Run/Stop" key.

Maintenance	99m
-------------	-----

### Automatic flush

Start a flush of the plant with the programmed flushing duration via this manual function:

(s.a. "M" → Basic programm → Flush → Duration)

After the start a return to the operating display occurs.

It is possible to end the flush at any time with the "Run/Stop" key.

FLUSH	1m
-------	----

## Error history

Open the error history via "show". The error history is a list of the errors which have occurred during current operation.

The occurred error is recorded with error number, time and date,

e.g.:                      **Low w. press    6**  
   **16:56    16.09.03**

ERROR HISTORY	
display	
clear	

The errors are stored in a ring buffer with a maximum of 20 errors, i.e. the oldest error is overwritten by the new one if the memory is full.

The memory of the error history is deleted via "delete" and recording is started anew.

The list is not deleted after a power failure.



## Calibration of the conductivity sensor CD

**Calibration should only take place with calibration solvents in accordance with DIN EN 27888!  
Inappropriate calibration leads to undefined display values !**

### Dry and zero point calibration

With the **calibration method CAL. CD ZERO** it is possible to compensate measuring errors (offset) which occur due to very long supply lines to the measuring sensor.

The sensor is calibrated "dry", i.e. it is not dipped into the measuring medium:

a) Either with a built-in sensor, before the tube system is filled or b) with a not yet built-in sensor, but already equipped with the correct cable length. b) bei noch nicht eingebauter Sonde aber schon mit der richtigen Kabellänge.

Call the following menu option to start calibration

`"M" → Service → Cal. CD Zero` and start by pressing `"ENTER"`.

The unit now corrects the measuring error caused by the cable length via subtraction. The process ends automatically.

### Sollwert-Kalibrierung

With the **calibration method CAL. CD desired value** it is possible to correct measuring errors caused by a soiled sensor.

It is recommended to also calibrate with this method if there are high accuracy demands in a small measuring range. This calibration method also enables measurements with a sensor whose cell constant is not exactly known.

Procedur:

Carry out the calibration with an appropriate KCl standard calibration solvent. For this, dip the measuring sensor into the calibration solvent. Please observe that the sensors are free moving in the vessel.

**-With automatic temperature compensation:** First, enter a temperature coefficient of 1.90%/°C in the BASIC PROGRAM menu "Temp. comp." and the value of the standard calibration solvent at 25/°C under desired value. After dipping the sensor into the calibration solvent, wait approx. 2 minutes before starting the calibration until the sensor has the same temperature as the solvent.

**-With manual temperature compensation:** If you wish to calibrate a sensor without a temperature transmitter, you have to enter **"manual temp. compensation"** in the basic program and the temperature of the calibration solvent under **"Temperature"**. A temperature of 25°C for the calibration solvent is also valid here.

1. Call the menu "Calibrate CD"

`"M" → Service → Cal. CD desired calibration`

2. Enter the desired value of the conductivity and save the value by pressing `"ENTER"`.

3. Call the following menu option to start calibration

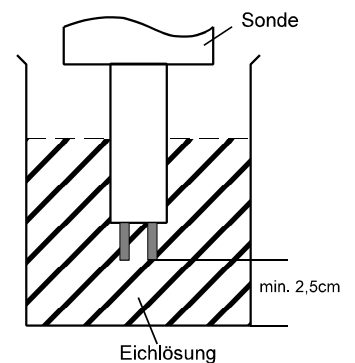
`"M" → Service → Cal. CD start` and start by pressing `"ENTER"`.

The unit now corrects the measuring error by forming a correction factor. The calibration ends automatically.

### Note!

**Inappropriate calibration can lead to the display of undefined values. Incorrect calibration can only be corrected via a new calibration or via a "CAL. CD RESET".**

### Hinweis zum Kalibrieren:



## Operating hours

The instrument records operating hours of the pressure pump/s and thus the load of the units.

The current operating time can be requested in the service menu:

"M" → Service → Operating hours

### Resetting the operating hour meter:

After replacing the pump/s or the units, it is possible to reset the current operating time to 0 hours.

"M" → Service → Operating hours → Reset

## Pressure

The current pressure can be requested in the service menu:

Measuring input **IN 4-20mA** for the connection of a pressure transmitter with a 4-20mA output is used for the pressure monitoring of the pump or the unit. Please program the measuring range of the used pressure transmitter in the BASIC PROGRAM menu:

"M" → Grundprogramm → Fct. IN 4-20mA → max. pressure

PRESSURE
0.0bar

## Time / Date

Please observe that in the case of units without a clock module the time only runs if the unit is switched on. After a longer period of power failure or if the plant was switched off, the time and date should, if necessary, be corrected.

TIME	DATE
10:23	01.01.01

**Anzeige:** "M" → Service → Time Date

The date and time of the controller are shown in the display.

**Setting:** Betätigen Sie unter Menü "M" → Service → Time Date die Taste "ENTER".

Set the time and date by selecting and activating the desired function via the arrow keys and the "ENTER" key. Subsequently press the "ENTER" key again to save the setting and to return to the display function.

## Diagnosis

The actual statuses of the inputs and outputs are displayed in the diagnosis menu. The statuses of the inputs can be manually manipulated via the "DOWN" and "UP" keys for test purposes, e.g. when commissioning. Please ensure that downstream plant components cannot be damaged.

Active statuses (switched relay, connected input) are displayed via "on", inactive statuses via "off", e.g.:

OUTPUT IV                      or                      INPUT LP  
                 off    on

The analogue input displays the existing value, e.g.:

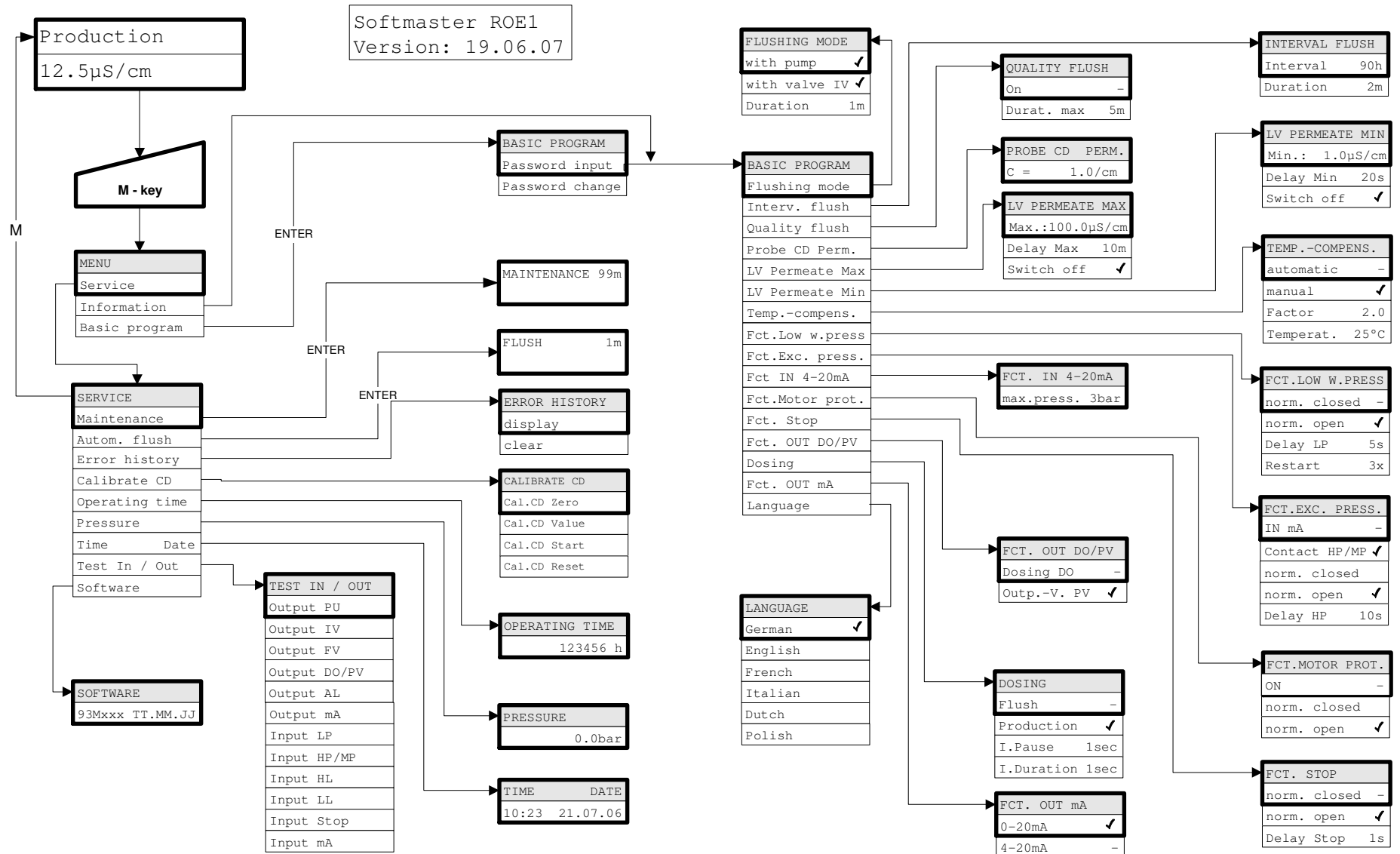
INPUT MA  
16.8mA

## Software status

Request the current software status here:

SOFTWARE
93Mxxx TT.MM.JJ

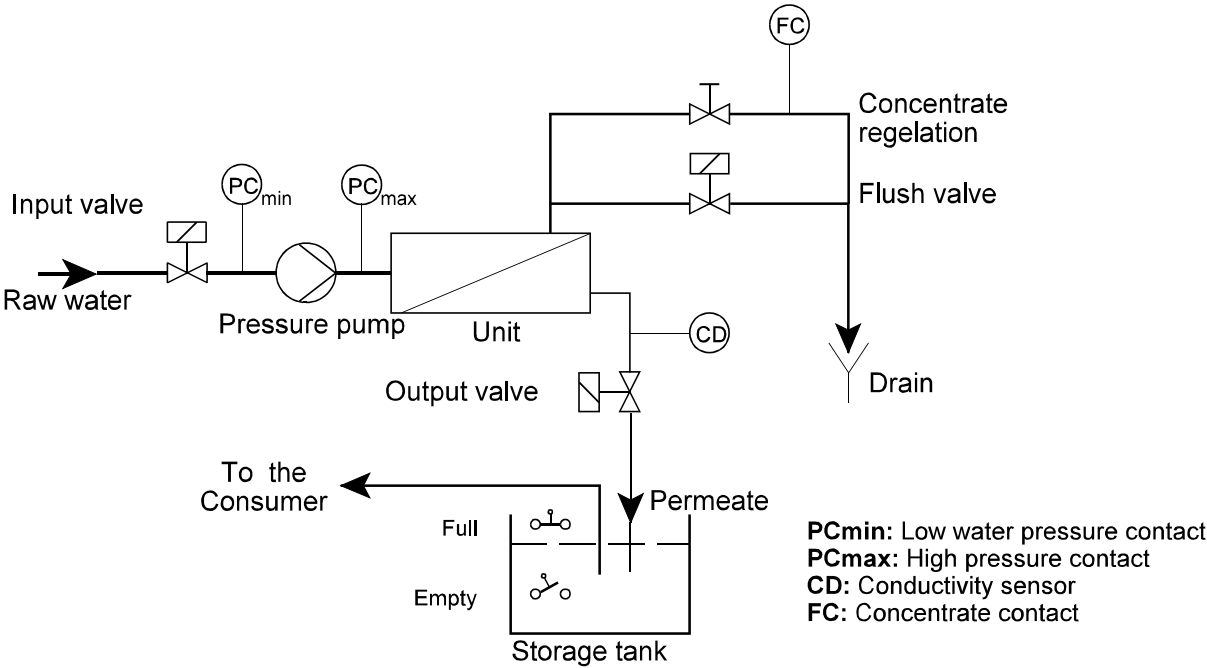
## Menu structure



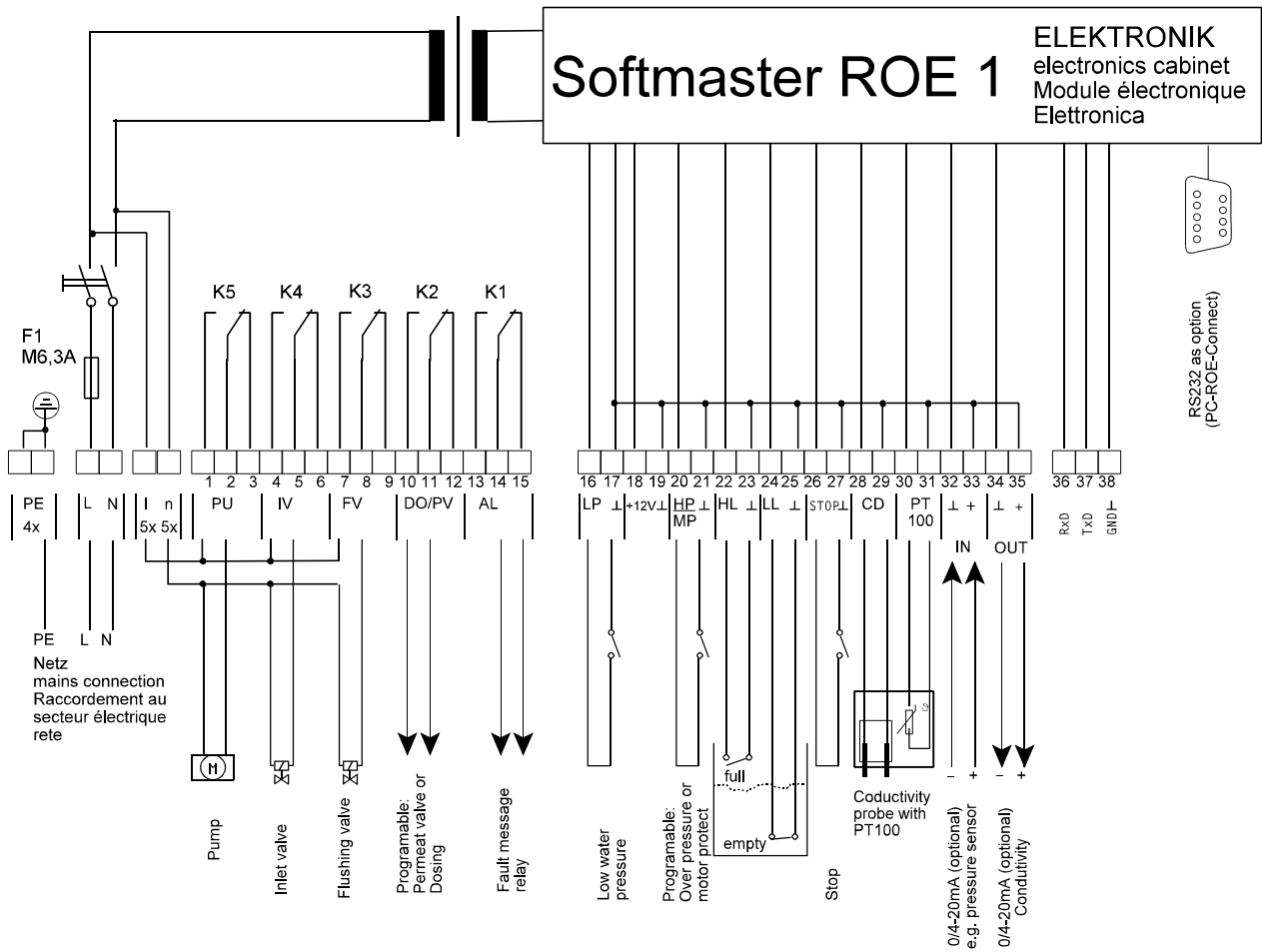
In order to call the factory's basic setting, switch the unit on while pressing the "DOWN" key. Your individual programming will be lost!

Technical Appendix

Example for an osmosis plant layout



Connection example



## Technical data

<b>Power supply, depending on version:</b>	Observe type plate ! 230 - 240 V or 24 V oder 115V+/-10% / 50 -60 Hz, fuse T6,3A
<b>Power consumption without exterior load:</b>	max. 5 VA
<b>Degree of protection:</b>	IP65
<b>protection class:</b>	I
<b>Conformity:</b>	EN 50081-1, EN 50082-2, EN 61010-1
<b>Ambient temperature:</b>	0 - 45°C



### Measuring ranges:

Measuring range	Cell constant	Sensor name, e.g.
0,01 - 19,99 $\mu\text{S/cm}$	0,01 $\text{cm}^{-1}$	SOE0, STE0 PT100
0,1 - 999,9 $\mu\text{S/cm}$	0,1 $\text{cm}^{-1}$	SO1, ST1 PT100, SOE1
0,5 - 4999 $\mu\text{S/cm}$	0,5 $\text{cm}^{-1}$	SO5, SOE5, ST5 PT100
1 - 9999 $\mu\text{S/cm}$	1,0 $\text{cm}^{-1}$	SD10, SO10
5 $\mu\text{S/cm}$ -49,99 $\text{mS/cm}$	5,0 $\text{cm}^{-1}$	STE50 PT100

### Accessories for calibration:

Conductivity solvent

1413  $\mu\text{S/cm}$

230 ml Art.-No.: 425404

### Housing dimensions

#### wall-mounted/panel-mounted ROE 1:

B x H x D = approx. 270 x 295 x 130 mm  
Housing made of ABS,  
Panel cut-out 262mm x 146mm, +1mm,  
Installation depth approx. 90mm,  
Front frame dimension 270mm x 155mm

### Weight:

Approx. 2,3 kg

**We reserve the right to make technical changes without notice in the interest of constantly improving our products!**