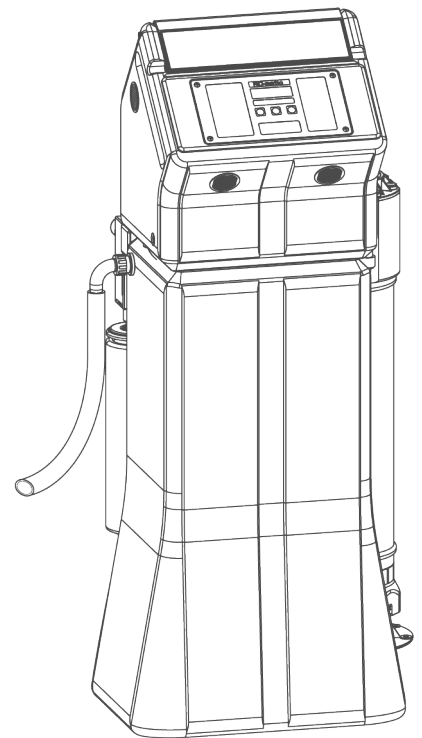


# Operation Manual

## Reverse osmosis system

### AVRO 125 TS/TL



Edition Februar 2019  
Order no. 215 752 945-inter

#### **Grünbeck Wasseraufbereitung GmbH**

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**A company certified by TÜV SÜD**  
in accordance with DIN EN ISO 9001,  
DIN EN ISO 14001 and SCC

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Printing: Grünbeck Wasseraufbereitung GmbH

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grünbeck



### **EU Declaration of Conformity**

This is to certify that the system designated below meets the safety and health requirements of the applicable European guidelines in terms of its design, construction and execution.

This certificate will become invalid if the system is modified in a way not approved by us.

Manufacturer: Grünbeck Wasseraufbereitung GmbH  
Josef-Grünbeck-Strasse  
89420 Hoechstädt/Germany

Responsible for documentation: Markus Pöpperl

System designation: Reverse osmosis system AVRO 125

System type: TL/TS

Serial no.: Refer to type designation plate


Applicable directives: Machinery Directive (2006/42/EC)  
EMC (2014/30/EU)

Applied harmonised standards,  
in particular: EN ISO 12100:2011-03,  
EN 61000-6-2:2006-03  
EN 61000-6-3:2011-09

Applied national standards  
and technical specifications,  
in particular:

Place, date and signature: Hoechstädt, 30.04.2018

i. V.

  
M. Pöpperl  
Dipl. Ing. (FH)

Function of signatory: Head of Technical Product Design

## A General information

### 1 | Preface

Thank you for opting for a Grünbeck product. Backed by decades of experience in the area of water treatment, we provide customised solutions for all kind of processes.

Drinking water is classified as food and requires particular care. Therefore, always ensure the required hygiene in operating and maintaining systems involved in the drinking water supply. This also applies to the treatment of water for industrial use if repercussions for the drinking water cannot completely be excluded.

All Grünbeck systems and devices are made of high-quality materials. This ensures trouble-free operation over many years, provided you treat your water treatment system with the required care. These operating instructions assist you with important information. Therefore, please read the entire operation manual before installing, operating or maintaining the system.

Customer satisfaction is our prime objective. And providing customers with qualified advice is crucial. If you have any questions concerning this system, possible extensions or general water and waste water treatment, our field service staff, as well as the experts at our headquarters in Hoechststedt, are available to help you.

**Advice and assistance** For advice and assistance please contact your local representative (refer to [www.gruenbeck.de](http://www.gruenbeck.de)). You can also get in touch with our service centre, which can be reached during business hours:

Phone: +49 9074 41-333

Fax: +49 9074/41-120

E-mail: [service@gruenbeck.de](mailto:service@gruenbeck.de)

We can connect you with the appropriate expert more quickly if you provide the required system data. In order to have the required data handy at all times, please copy it from the type designation plate to the overview in chapter C-12.

### 2 | Notes on using the operation manual

This operation manual is intended for operators of our systems. It is divided into several chapters (a letter is assigned to each of them) that are listed in the "Table of contents" on page 2 in alphabetical order. Check for the corresponding chapter on page 2 in order to find the specific information you are looking for.

The headers and page numbers with chapter information make it easier to find your way around in the operation manual.

### 3 | General safety information

**3.1 Symbols and notes** Important information in this operation manual is emphasised by symbols. Please pay particular attention to this information to ensure the hazard-free, safe and efficient handling of the system.



**Danger!** Failure to adhere to this information will cause serious or life-threatening injuries, extreme damage to property or inadmissible contamination of the drinking water.



**Warning!** Failure to adhere to this information can cause injuries, damage to property or contamination of the drinking water.



**Caution!** Failure to adhere to this information can result in damage to the system or other objects.



**Note:** This symbol emphasises information and tips that make your work easier.



Tasks with this symbol are only allowed to be performed by Grünbeck's technical service/authorised service company or by persons expressly authorised by Grünbeck.



Tasks with this symbol are only allowed to be performed by trained and qualified electrical experts according to the VDE guidelines or according to the guidelines of a similar local institution.



Tasks with this symbol are only allowed to be performed by water suppliers or approved installation companies. In Germany, the installation company must be registered in an installation directory of a water supplier as per §12(2) AVBWasserV (German Ordinance on General Conditions for the Supply of Water).

#### 3.2 Operating personnel

Only allow persons who have read and understood this operation manual to work with the system. The safety guidelines are to be strictly adhered to.

#### 3.3 Intended use

The system is only allowed to be used for the purpose outlined in the product description (chapter C). The guidelines in this operation manual as well as the applicable local guidelines concerning the drinking water protection, accident prevention and occupational safety must be adhered to.

In addition, appropriate application also implies that the system is only allowed to be operated when it is in proper working order. Any malfunctions must be repaired at once.

### 3.4 Protection from water damage



**Warning!** In order to properly protect the installation site from water damage:

- a) a sufficient floor drain system must be available or
- b) a safety device (refer to chapter C Optional accessories) must be installed.



**Warning!** Floor drains that discharge to a lifting system will not work in case of a power failure.

### 3.5 Indication of specific dangers

Danger due to electrical energy! → Do not touch electrical parts with wet hands! Disconnect the system from the mains before starting work on electrical system components! Have qualified experts replace damaged cables immediately.

Danger due to mechanical energy! System components can be subject to overpressure. Danger of injury and damage to property due to escaping water and unexpected movement of system parts.

→ Check pressure lines regularly. Depressurise the system before starting repair or maintenance work on the system.

Hazardous to health due to contaminated drinking water! → The system shall be installed only by a specialist company. Strictly adhere to the operating instructions! Ensure that there is sufficient flow. The pertinent guidelines must be followed for starting-up after extended periods of standstill. Inspections and maintenance must be performed at the intervals specified!



**Note:** By concluding a maintenance contract, you ensure that all of the required tasks are performed on time. You can perform the interim inspections yourself.

## 4 | Shipping and storage



**Caution!** The system can be damaged by frost or high temperatures. In order to avoid damage of this kind:

Protect from frost during shipping and storage!

Do not install or store system next to objects which radiate a lot of heat.

## **5 | Disposal**

Comply with the applicable national regulations.

### **5.1. Packaging**

Dispose of the packaging in an environmentally sound manner.

### **5.2. Product**



If this symbol (crossed out waste bin) is on the product, European Directive 2012/19/EU applies to this product. This means that this product and the electrical and electronic components must not be disposed of as household waste.

Dispose of electrical and electronic products or components in an environmentally sound manner.



For information on collection points for your product, contact your municipality, the public waste management authority, an authorised body for the disposal of electrical and electronic products or your waste collection service.



## **B Basic Informations (Reverse osmosis)**

### **1 | Laws, regulations, standards**

In the interest of good health, rules cannot be ignored when it comes to the processing of drinking water. This operation manual takes into consideration the current guidelines and stipulates information that you will need for the safe operation of your water treatment system.

Among other things, the regulations stipulate that

- only approved specialist companies are permitted to make major modifications to water supply systems
- and that checks, inspections and maintenance on installed devices are to be performed at regular intervals.

### **2 | Water**

There is no chemically pure water in nature. Even in the atmosphere, rain water absorbs various substances that change the properties of the water to a greater or lesser degree. This process continues as the water passes through the ground layers, with the result that the water is enriched with increasingly large quantities of materials. Carbon dioxide (CO<sub>2</sub>) is particularly important here, since this substance increases the dissolving capability of the water even more.

Consequently, drinking water contains quantities of dissolved sodium, potassium, calcium, magnesium, iron, manganese, copper, zinc, chlorides, fluorides, sulphates and also nitrates, nitrites, phosphates and silicates that vary greatly from location to location.

Due to dynamic substance and water cycles, harmful elements, are increasingly being released into the natural environment. These are only partially and slowly broken down by natural effects. Consequently, these elements build up in the groundwater and surface water over the course of time. Removing them from natural water deposits again represents a particular challenge. Grünbeck faces this challenge with the aim of producing unpolluted drinking and industrial water.

The water works provide us with pure drinking water that is suitable for consumption. However, if the water is to be used for technical purposes, further treatment is frequently required.

### 3 | Functional principle of reverse osmosis

**Principle:**

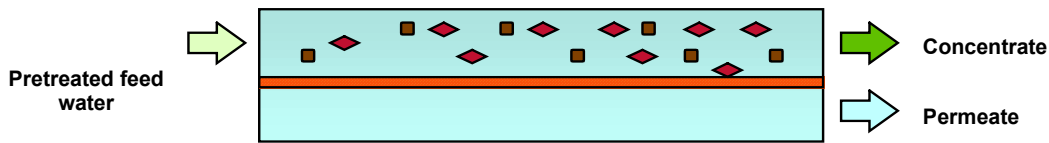


Fig. B-1: Functional principle

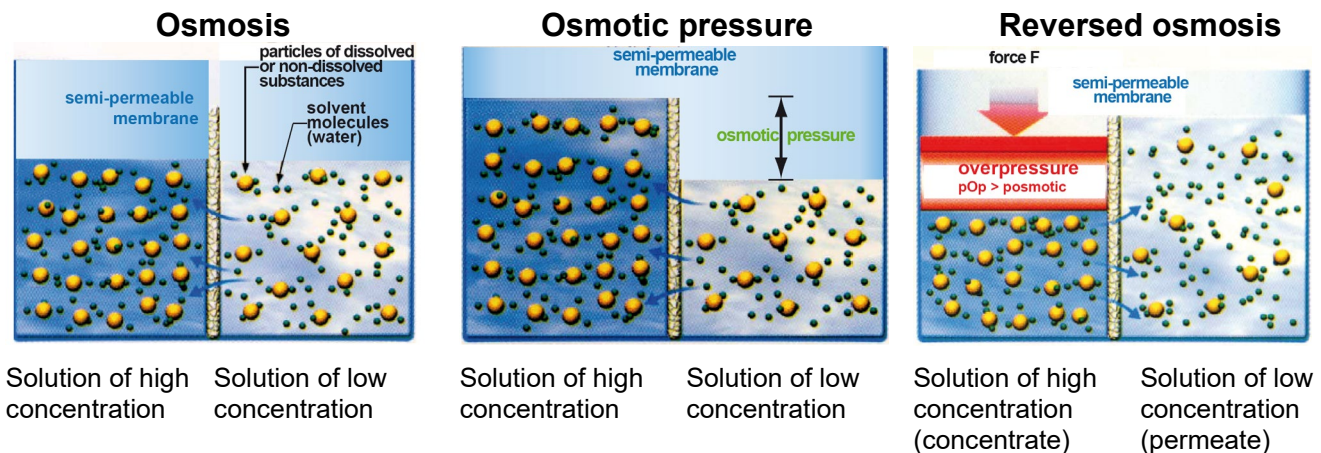


Fig. B-2: Reverse osmosis principle

In the osmosis process, aqueous solutions of different concentrations are separated by a semi-permeable membrane. In keeping with the law of nature, the concentrations will tend to equalise. What is referred to as "osmotic pressure" is generated on the side of the higher original concentration.

In case of reverse osmosis, this osmotic pressure is countered by a higher pressure. The consequence: The process runs in the opposite direction. A particular advantage of the reverse osmosis technology compared to other water treatment processes is the fact that apart from the removal of dissolved salts, bacteria, germs, particles, and dissolved organic substances are also reduced.

## C Product description

### 1 | Type designation plate

The type designation plate can be found on the housing of the reverse osmosis system AVRO 125 TS/TL. In order to speed up the processing of your inquiries or orders, please specify the data shown on the type designation plate of your system when contacting Grünbeck. Please copy the indicated information to the table below in order to have it handy whenever necessary.

#### Reverse osmosis system AVRO 125 TS/TL

**125** n n    **Serial number:** n n n n n n / n

**Order number:** n n n n n n

		grünbeck	
Umkehrosmoseanlage AVRO 125 TS			
<b>Anschlussnennweite</b>	<b>1/2" (DN 15) AG</b>	<b>Netzanschluss</b>	<b>230 V / 50 Hz</b>
Nominal connection size		Mains supply	
Diamètre nominal de raccord		Raccordement au réseau	
<b>Permeatleistung (15 °C)</b>	<b>125 l/h</b>	<b>Elektrische Anschlussleistung</b>	<b>0,7 kW</b>
Permeat volume (15 °C)		Connected load	
Débit de perméat pour une temp. (15 °C)		Puissance électrique consommée	
<b>Nenndruck</b>	<b>PN 16</b>	<b>Bestell-Nr.</b>	<b>752 105.</b>
Nominal pressure		Order no.	
Pression nominale		Référence	
<b>Zulaufdruck min.</b>	<b>2,5 bar</b>	<b>Serien-Nr.</b>	
Feed pressure min.		Serial-no.	
Pression d'eau d'alimentation min.		N° de serie	
<b>Zulaufwassertemp. min./max.</b>	<b>10/30 °C</b>		
Feed water temperature min./max.			
Temp. d'eau d'alimentation min./max.			
<b>Betriebsanleitung beachten!</b> Operating instructions must be observed! Respecter la notice d'instructions!			
Grünbeck Wasseraufbereitung GmbH   Josef-Grünbeck-Str. 1   89420 Hoechstädt   www.gruenbeck.com			

Fig. C-1: Type designation plate

## **2 | Functional description**

Via the fine filter (filter element), the water is directed to the inlet of the feed water section. The water flows to the high-pressure pump via the inlet solenoid valve with a downstream pressure switch for minimum pressure. By means of an adjusting valve, the pressure generated by the pump is reduced to the required operating pressure and the water is directed to the membrane. The membrane separates the water into the partial flows permeate and concentrate. A partial flow of the concentrate is returned to the feed water via an orifice regulating independently of pressure and thus ensures a steady flow over the reverse osmosis membrane and increases the economic efficiency of the reverse osmosis system.

At the same time, the concentrate volume flow is run via an AVRO treatment module, where seed crystals are formed at a cathode due to the application of direct current. These seed crystals are then washed out with the residual concentrate and thus the reverse osmosis membrane is protected from clogging. Whenever the system is switched off (tank full) or in case of disturbances, the substances retained on the membrane are flushed off by means of the inlet solenoid valve and a solenoid valve switched in parallel to the control valve for concentrate.

The hydraulic set-up of the system is designed in a way that the concentrate volume and the permeate volume are registered by means of flow sensors and are displayed in the control unit. The system recovery can also be called up in the control unit.

<sup>1)</sup> The permeate produced is fed into a light-tight reservoir. A level control with three switching contacts is integrated in the tank. In order to supply the consumers with permeate, a centrifugal pump made of high-performance plastics including pressure switch and diaphragm expansion tank is integrated in the system as pressure booster system.

<sup>1)</sup> Only AVRO 125 TS

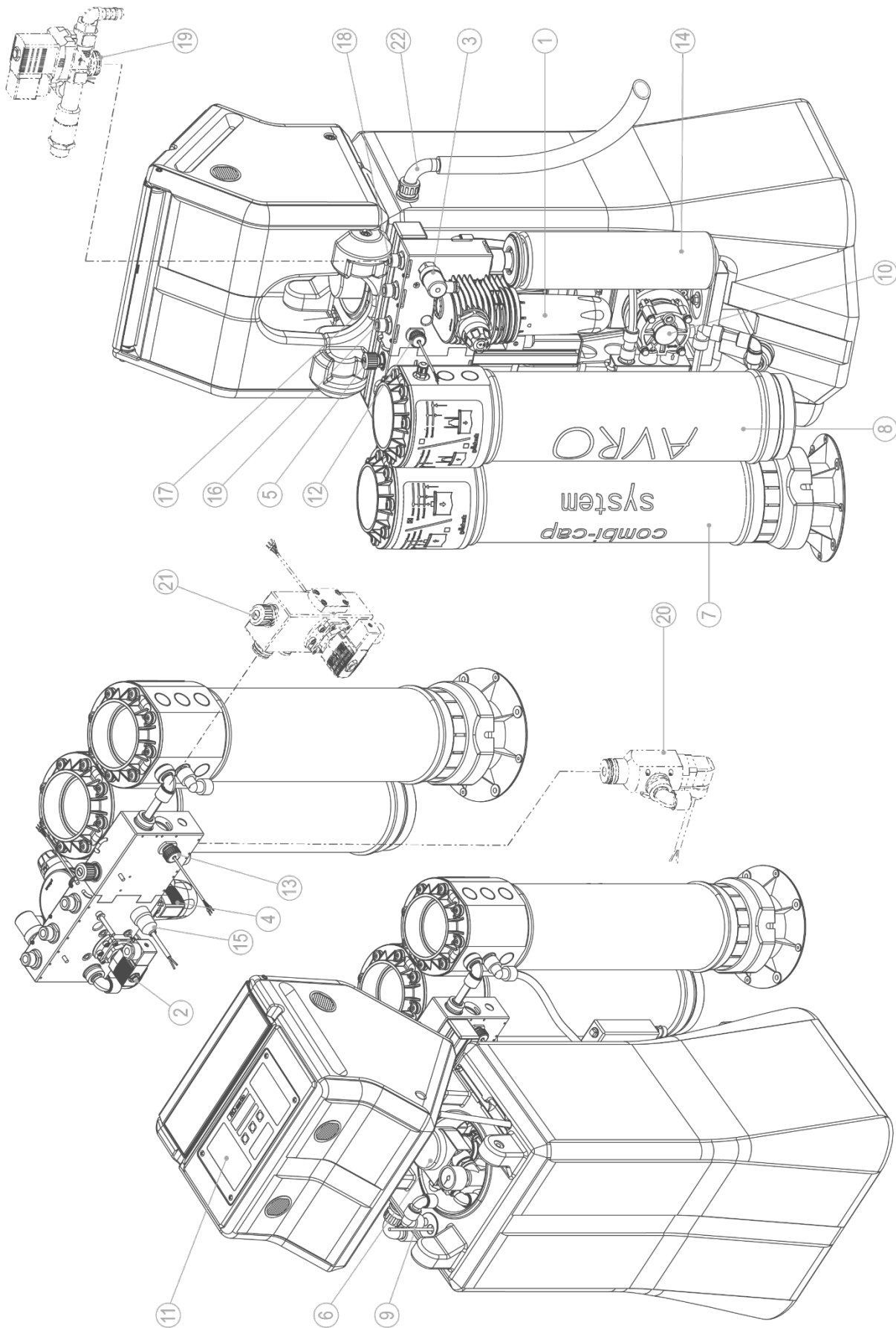


Fig. C-2: Exploded drawing reverse osmosis system AVRO 125 TS/TL-TS

① Fine filter incl. pressure reducer	Pressure reducer preset to 2.5 bar, incl. pressure gauge.
② Inlet solenoid valve	During permeate output, this valve is always open. Following the system stop (tank full), the valve remains open for the programmed flushing time of the membranes. Visual indication in the control unit ⑪.
③ Pressure switch Pressure booster pump	Switches the pressure booster on when water is required, and off again after water withdrawal ends.
④ Flushing solenoid valve	Opens after the level control ⑨ in the tank reports "FULL" to the control unit for a set time. The solenoid valve also opens in the event of system malfunctions and always in conjunction with the inlet solenoid valve ②.
⑤ Needle valve, concentrate	To set the feed water-dependent "concentrate" volume flow to the drain. During permeate output, this portion of the water flow permanently flows to the drain.
⑥ High-pressure pump	Pump unit that generates the operating pressure required for the membrane. Pump operates on permeate request from the level control ⑨ (LB switches) located in the permeate tank. A control valve for adjusting the operating pressure is integrated in the pump head. Visual indication in the control unit ⑪.
⑦ Membrane	Reverse osmosis membrane to generate the permeate.
⑧ AVRO treatment unit	AVRO treatment unit to generate seed crystals.
⑨ Level control	Float level control for controlling the water level in the permeate tank (TS version only).
⑩ Booster pump	Pressure booster pump feeds permeate into the consumer network (only TS version).
⑪ Control unit	Microprocessor controller that in conjunction with the respective units, regulates the permeate production and the supply of consumers downstream.
⑫ Flow sensor, concentrate	Registers the concentrate volume and sends pulses to the control unit. Visual indication of the permeate volume in the control unit ⑪.
⑬ Flow sensor Permeate	Records the permeate volume and sends pulses to the control unit. Visual indication of the permeate volume in the control unit ⑪.
⑭ Diaphragm expansion tank	Permeate buffer to reduce the switching operations of the DE pump.
⑮ Pressure switch High-pressure pump	To prevent the high-pressure pump from running dry. Switches time-delayed after the solenoid valve has opened ②. Visual indication in the control unit ⑪.
⑯ Connection ½" (DN 15) male thread	Concentrate to drain.
⑰ Connection ½" (DN 15) male thread	Feed water.
⑱ Connection ½" (DN 15) male thread	Permeate/consumer.
⑲ Option:	Solenoid valve forced withdrawal.
⑳ Option:	Conductivity measurement.
㉑ Option:	Blending unit.
㉒ Tank overflow	For connection to drain provided by others

## 2.1 Flow chart of reverse osmosis system AVRO 125 TS/TL

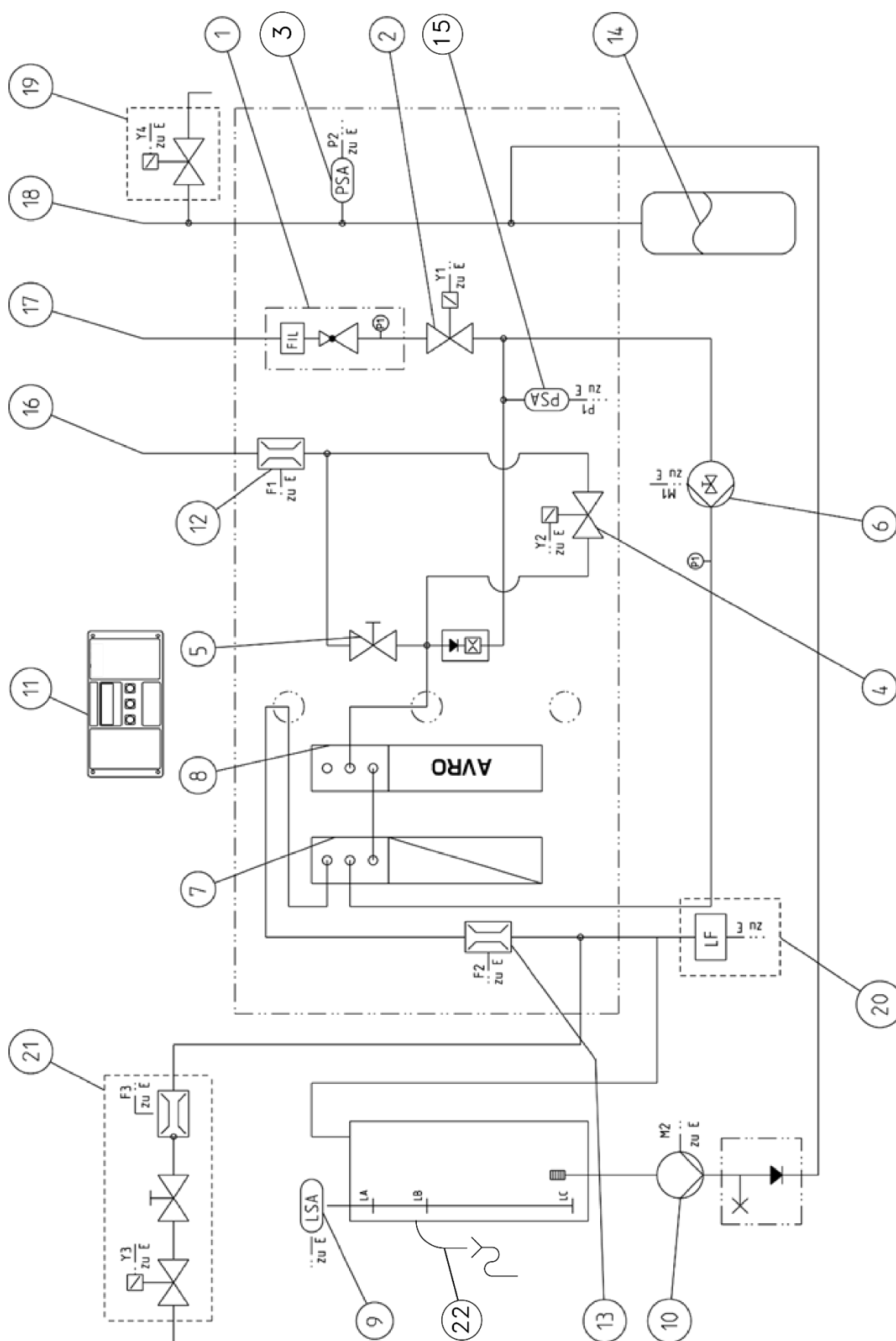


Fig. C-2.1: Flowchart of reverse osmosis system AVRO 125 TS/TL-TS

Technical specifications	Reverse osmosis system	
	AVRO 125 TS	AVRO 125 TL
Connection data		
Nominal connection diameter of feed water pipe	½" (DN 15) male thread	
Nominal connection diameter of permeate outlet	½" (DN 15) male thread	
Nominal connection diameter of concentrate outlet	½" (DN 15) male thread	
Min. drain connection required	DN 50	
Connected load, approx. [kW]	0.7	0.6
Power supply [V/Hz]	230 / 50	
Protection/protection class	IP 54 / ⊕	
Performance data		
Permeate output at a feed water temperature of 10 °C / 15 °C [l/h]	105 / 125	
Electrical capacity of pump at operating pressure [kW]	0.55	
Permeate output per day (max. 24 h) approx. min./max. [m³/d]	2.5 / 3.0	
Inlet flow pressure of feed water, min. [bar]	2.5	
Permeate supply approx. [l]	38	-
Pump characteristic curve pressure booster [l/h/bar]	300 / 3.5 - 1200 / 1.0	-
Nominal pressure	PN 16	
Salt rejection	95 – 99 %	
Total salt concentration of the feed water as NaCl, max. [ppm]	1000	
Concentrate volume flow (at 15 °C) [l/h]	125 <sup>1)</sup>	
Feed water volume flow (fresh water 15 °C) at a recovery of 50 %, max. [l/h]	250	
Recovery [%]	50 <sup>1)</sup>	
Dimensions and weights		
Dimensions (w x d x h) [mm]	600 x 550 x 1120	
Empty weight, approx. [kg]	45	38
Operating weight, approx. [kg]	85	40
Ambient data		
Temperature of feed water, min./max. [°C]	10 / 30 <sup>2)</sup>	
Ambient temperature, min./max. [°C]	5 / 35	
Order no.	752 105	752 115

<sup>1)</sup> After a water analysis, the technical service can set a higher recovery.

<sup>2)</sup> For a feed water temperature > 20 °C a separate configuration of the system is required..



### 3 | Intended use

The reverse osmosis system AVRO 125 TS/TL is used for demineralising drinking water. The water is primarily used for industrial applications.

The permeate capacity of the system depends on the temperature and is defined at 15 °C. The permeate outputs can fall (falling temperature) or rise (rising temperature) by up to 3 % for each °C rise or fall in the feed water temperature.

The system is adjusted to the permeate requirements to be expected at the installation site, it is not suitable for major deviations.

Only operate the system if all components are properly installed. Safety devices and equipment must NEVER be removed, bridged or tampered with.

Appropriate application of the device also implies that the information contained in this operation manual and all safety guidelines applying at the installation site be observed. Furthermore, the maintenance and inspection intervals have to be observed.

The reverse osmosis system AVRO 125 TS/TL is designed exclusively for use in industrial and commercial applications.

#### 3.1 System shutdown

If the system is shut down for more than 14 days, the reverse osmosis system must be preserved by Grünbeck's technical service/authorised service company. The maximum time, the system can remain in the preserved condition is 6 months.

In case the down time is longer, the system must be preserved again in regular intervals by Grünbeck's technical service/authorised service company. Prior to resuming operation, the preserving agent must be flushed from the system.

## 4 | Application limits

For the application of the reverse osmosis system AVRO 125 TS/TL, the limit values stipulated in the German Drinking Water Ordinance represent the upper limits for the admissible substances contained in the water.

- < 22°dH (39.2° f; 3.92 mmol/l) without water analysis
- Free chlorine not detectable
- Iron < 0.10 mg/l
- Manganese < 0.05 mg/l
- Silicate < 15 mg/l
- Chlorine dioxide not detectable
- Turbidity < 1 FTU
- Colloid index SDI < 3
- pH range 3 - 9

For total hardness > 22 °dH or sulphate > 250 mg/l a water analysis is required.



**Note:** The permeate originating from the reverse osmosis system is not potable but requires additional treatment (blending, hardening) if it is to be used as drinking water.



**Caution!** In case of an admissible excess of the sulphate concentration due to geogenic conditions, the recovery with regard to the standard settings according to layout might need to be reduced.

## 5 | Scope of supply

- 5.1 Standard equipment
- Stand-alone housing made of opaque PE to accommodate all aggregates and control elements. Stand-alone housing also serves as supply tank incl. overflow (AVRO 125 TS/TL-TS only).
  - Microprocessor controller with LC display, voltage-free collective fault signal and voltage-free signal contact (maintenance interval, various pre-warnings), installed in a stand-alone housing.
  - Sliding-vane rotary pump made of corrosion-resistant brass with motor as high-pressure pump to supply the membrane, incl. control valve for operating pressure and pressure gauge.
  - <sup>1)</sup> External pressure booster with pressure switch and membrane connection vessel for supplying permeate to downstream consumers.
  - Hydro module for the water supply within the membrane system. Integrated valves and measuring instruments for easier system calibration.
  - Fine filter with integrated pressure reducer, preset to 2.5 bar.
  - Ultra-low pressure reverse osmosis membrane, installed in pressure pipe made of high-strength PE.
  - AVRO treatment unit, installed in a pressure pipe made of high-strength PE.
  - Flow sensor to measure the volume of the system flows permeate and concentrate.
  - Operation manual.
- <sup>1)</sup> only AVRO 125 TS.

## 5.2 Optional features



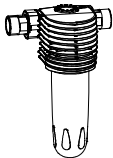
**Note:** It is possible to retrofit existing systems with optional components. Please contact your local Grünbeck representative or Grünbeck's headquarters in Hoechstädt for more information.

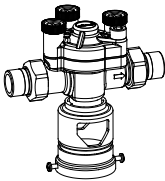
- |   |         |
|---|---------|
| • Connection block for RO 125 K/AVRO 125<br>Connection block (installation length 180 mm).<br>Permeate-resistant incl. two shut-off valves –<br>suitable for connection set | 752 840 |
| • Connection set for RO 125 K/AVRO 125<br>2 flexible connection hoses DN 15<br>(L = 600 mm) for feed water and permeate<br>1 drain hose for concentrate                     | 752 830 |

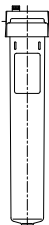
- Conductivity measurement for RO 125 K/AVRO 125  
As plug-on circuit board for the control unit.  
Display with limit value and delay, incl. connecting line and conductivity measuring cell.

752 820
- Solenoid valve forced withdrawal RO 125K/AVRO 125  
Solenoid valve adaptable on permeate outlet.  
Hydro modul for forced withdrawal with AVRO 125 TS from the tank during lengthy idle times.  
Electrically controlled from the AVRO 125 TS control unit.

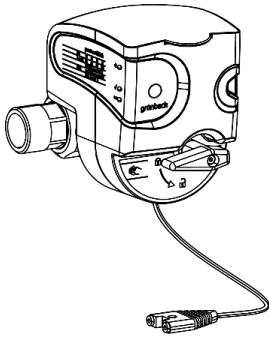
752 810
- Blending unit for AVRO 125  
Adaptable control unit on hydraulic unit AVRO 125 TS/TL consisting of: Connection G  $\frac{3}{4}$  for feed water, solenoid valve, needle valve, flow sensor to display the total blended water in the control unit AVRO 125 TS/TL, connection option for blended water in AVRO 125 TS/TL or on-site tank.

752 815
- 
  - Drinking water filter BOXER K  
Filter element for prefiltration.

101 210
- 
  - Euro system separator GENO-DK 2 Mini  
For protecting systems hazardous to drinking water in accordance with DIN 1988 Part 4 (DIN EN 1717) GENO-DK 2 Mini.

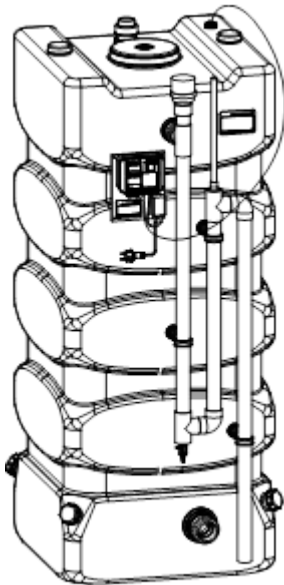
133 100
- 
  - GENO activated carbon filter AKF 300  
For reducing the chlorine content in water.

109 150



- **Safety device protectliQ:A20**  
Safety device for protection against water damage in one and two-family homes  
For additional versions, please inquire.

126 400



- Pure water tank for intermediate storage of permeate flowing unpressurised from GENO-reverse osmosis systems  
Tank design:  
All tanks are pre-assembled, with PVC overflow pipe as well as connections for the permeate inlet and the suction line of the pressure booster system. Grey PE. Handhole with removable screwed cover and level control GENO-Multi Niveau (switching level).

- Pure water basic tank RT "sterile" cpl.  
net volume approx. 850 litres / L 780 / W 990 / overall height 2000 mm\*.
- Add-on tank RT for pure water basic tank  
net volume approx. 850 litres / L 780 / W 780 / overall height 2100 mm\*.
- Pure water basic tank RT "standard"  
net volume approx. 850 litres / L 780 / W 1000 / overall height 2050 mm\*\*.

712 400

712 405

712 410

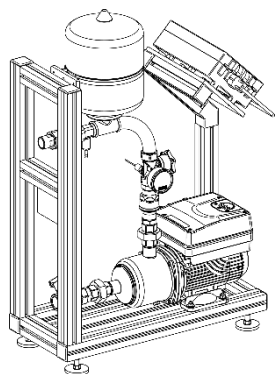
\* Tank height incl. connecting pieces.  
For larger tanks, please inquire

\*\* without sterile overflow channel as siphon – overflow as down-pipe

Additional tank without level control and overflow loop,  
including 2 connecting lines, id=36 mm.



**Note:** A maximum of four supply tanks can be combined.

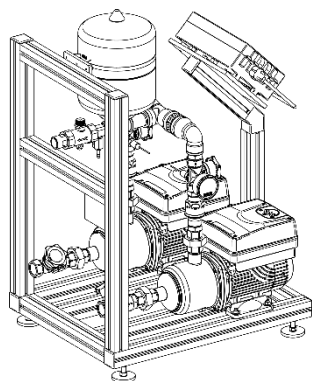


- **Pressure booster**  
**GENO FU-X 2/40-1 N**

730 640

Compact pump unit with pressure-dependent control consisting of a centrifugal pump cpl. stainless steel, as well as integrated pressure and contact water meter. Control electronics with power switching, back-lit graphic display. Operating switch, operating log via SD card, voltage-free signal/fault signal contact, non-return valve, shut-off valve for each pump (on suction and pressure side), membrane expansion vessel with forced flow.

Delivery rate:	max.	1,2 - 4,2 m <sup>3</sup> /h
Delivery head:	max.	18.2 – 45.6 m
Power supply:		230 V / 50 Hz
Power consumption:		1 kW
Connections:		DN 25 / DN 32
Protection type:		IP 55



- **Pressure booster**  
**GENO FU-X-2/40-2 N**

730 641

Description as for single pressure booster system, however, with the possibility for time-/load switch-over.

For additional pressure booster systems, please inquire

**5.3 Consumables**

Only use genuine consumables in order to ensure the reliable operation of the system.

GENO-replacement filter element, 103 061  
with protective cylinder  
Packing unit: 2 pc

Reverse osmosis membrane with seal 720 290  
Packaging unit: 1 pc

AVRO treatment unit with seals 720 050  
Packing unit: 1 pc

Water test kit "total hardness" °dH and °f. 170 187  
Packaging unit: 1 pc

Water test kit "carbonate" 170 169  
Packaging unit: 1 pc

**5.4 Wearing parts**

Seals and valves are subject to a certain wear and tear.  
Wearing parts are listed below:



**Note:** Although these parts are wearing parts, we grant a limited warranty period of 6 months.

- a) Solenoid valves, control valves, seals, water meter
- b) High-pressure pump
- c) Booster pump

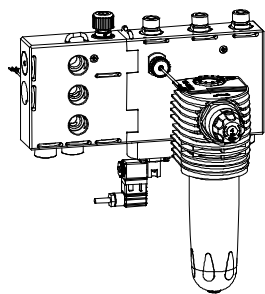


Fig. C-3: Valves

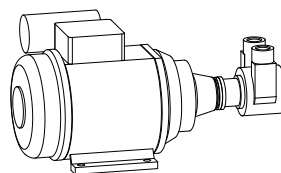
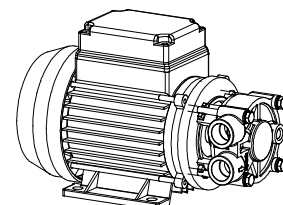


Fig. C-4: High-pressure pump



C-5: Pressure booster pump

## D Installation

### 1 | General installation information

The installation site must offer adequate space. A foundation of a sufficient size and adequate load carrying capacity has to be provided. The required connections must be provided prior to the installation. For dimensions and connection data, please refer to table C-1.



**Note:** Also observe the operation manuals that have been supplied with the optional accessories (see chapter C, 5.2) for your system (if applicable).

#### 1.1 Water connection

When installing the reverse osmosis system AVRO 125 TS/TL, certain rules must always be observed. Additional recommendations are given in order to facilitate the handling of the system. The installation instructions described below are also illustrated in fig. D-2.

##### **Binding rules**



The installation of a reverse osmosis system AVRO 125 TS/TL represents a major interference with the drinking water system. Therefore, only authorised experts are allowed to install such systems.

- Please observe the local installation guidelines and the general regulations.
- Install a drinking water filter (e.g. BOXER KD) upstream of the system.
- Install a system separator upstream.
- Install an activated carbon filter upstream, if required.
- Provide a drain connection (minimum DN 50) to discharge the concentrate.



**Note:** If the concentrate is directed to a lifting system, the delivery rate of the lifting system should at least be 500 l/h.



**Warning!** The installation site must have a floor drain. If no floor drain is available, an adequate safety device needs to be installed (refer to chapter C, no. 5.2 Optional accessories).



**Warning!** Floor drains that discharge to a lifting system will not work in case of a power failure.

##### **Recommendation**

Install a sample valve immediately before and after the reverse osmosis system AVRO 125 TS/TL. This simplifies the sampling for the regular quality control (functional check).



## 2 | Preliminary work

1. Unpack all system components.
2. Check for completeness and soundness.
3. Install the reverse osmosis system AVRO 125 TS/TL at the intended location.

## 3 | How to connect the system to the water supply

- Connect the feed water to the system (refer to fig. D-2, no. 3).
- Only for AVRO 125 TL: Connect the permeate line to the system and lead it to the on-site tank (refer to fig. D-2, no. 2).
- Connect the overflow tank (only for AVRO 125 TS) to the drain according to DIN EN 1717 .



**Note:** Permeate line must be made of corrosion-resistant material.

- Connect the concentrate line to the system (refer to fig. D-2, no. 1). Run the hose with a gradient to the drain and connect in accordance with DIN 1988 (free outlet).



**Note:** For connection of the system we recommend detachable screw connections. Furthermore, the connection is to be designed in such a way that the housing flap of the control unit can be folded back.

Grünbeck recommends: optionally

Connection block for RO 125 K/AVRO 125	752 840
Connection set for RO 125 K/AVRO 125	752 830



**Caution!** If withdrawal/supply points (e.g. on-site tank) of permeate from the RO-125K are below the connection level of the system, a pressure maintaining valve must be installed in the permeate line to protect the permeate tank against siphoning.

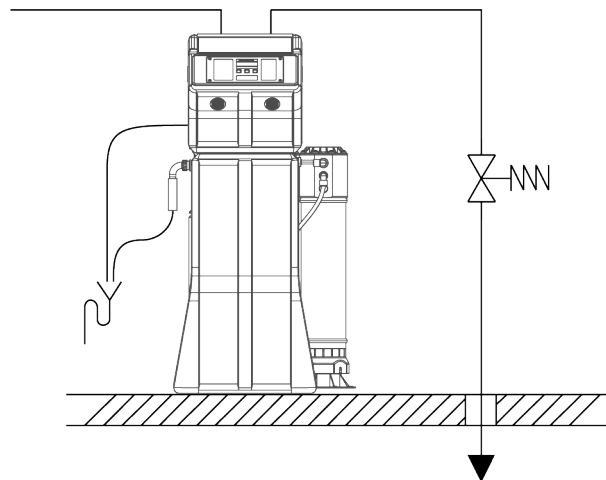
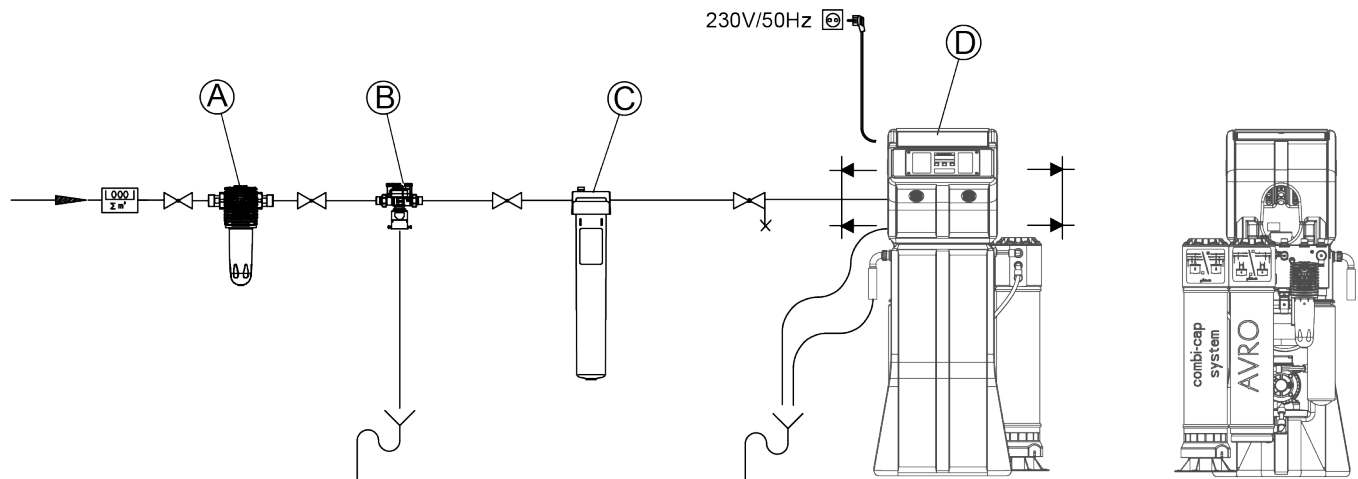
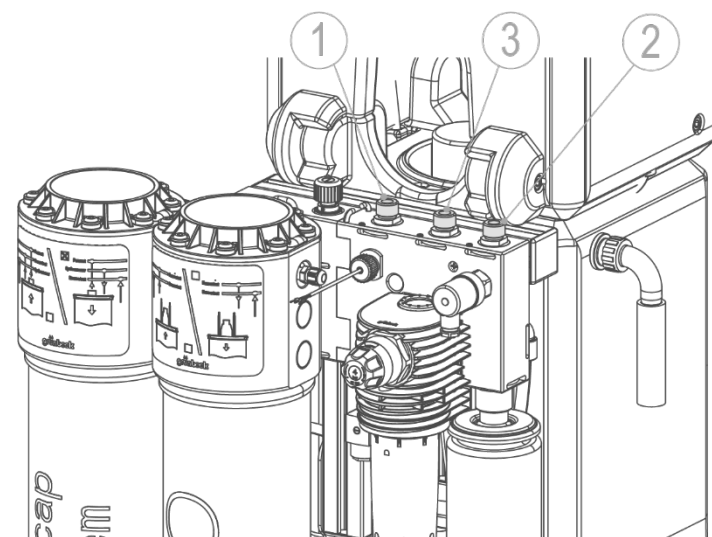


Fig. D-1: Withdrawal point below system level



- ① BOXER-KD
- ② Euro system separator DK 2-Mini
- ③ Activated carbon filter AKF
- ④ AVRO 125 TS/TL

Fig. D-2: Installation drawing reverse osmosis system AVRO 125 TS/TL



- ① Concentrate connection
- ② Permeate connection
- ③ Feed water connection

Fig. D-2: (a) Reverse osmosis system connections

## 4 | Electrical wiring

### Internal wiring of control unit GENO-OSMO-RO125K or AVRO 125 TS/TL

The system is completely pre-wired (possibly including options) and delivered ready to plug in. During start-up, parameter ECL:1 must be reprogrammed to ECL:0 at code level 113 (NC contact >>NO contact). This is a protective measure to prevent the system from being inadvertently switched on after the power cable has been plugged in, without the system having been vented first.

**Jumpers must be plugged in like this**

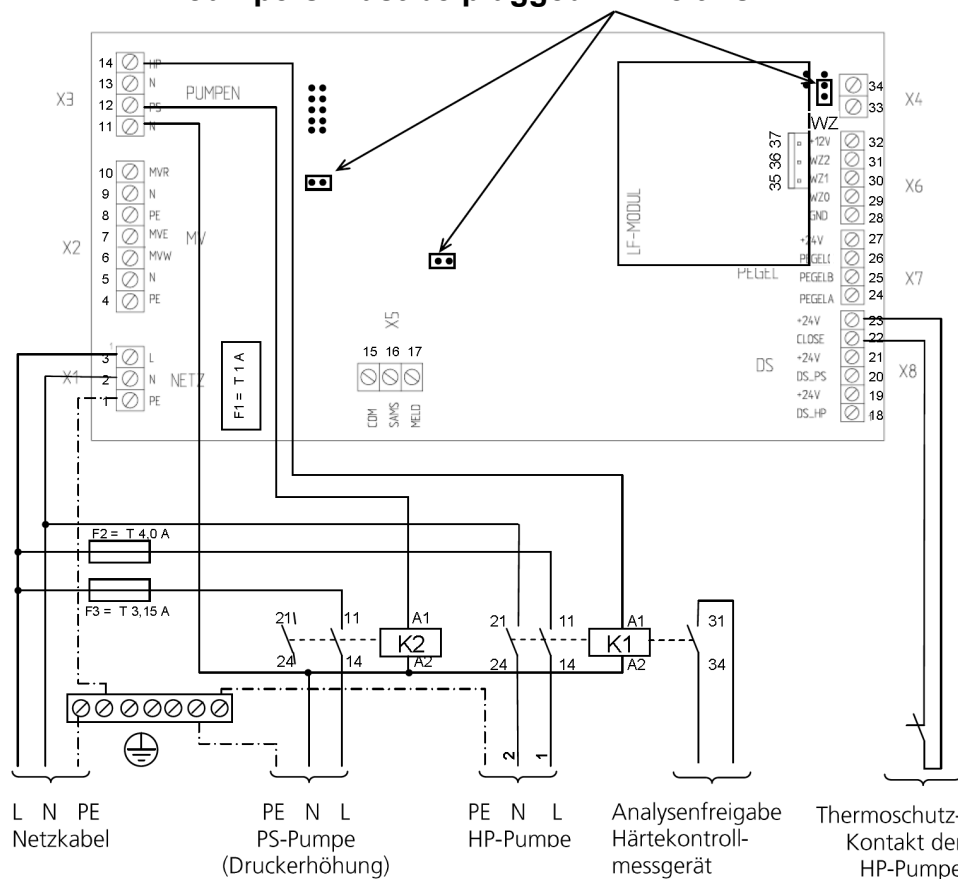


Fig. D-3: Printed circuit board assignment GENO- OSMO RO 125K or AVRO 125 TS/TL

Terminal no.	Terminal	Function (core colour)	Note
All protective grounding conductors are connected to the 7-pin protective grounding conductor terminal on the left-hand mounting rail			
X1	3	L	230 V / 50 Hz phase Mains cable, on-site fuse protection min. 6 A
	2	N	
	1	PE	
X2	6	MVW	230 V / 50 Hz phase Flusing solenoid valve
	5	N	Neutral conductor Common neutral conductor terminal
	7	MVE	230 V / 50 Hz phase Inlet solenoid valve
	10	MVR	230 V / 50 Hz phase Option: Solenoid valve forced withdrawal
	9	N	Neutral conductor

Terminal no.	Terminal	Function (core colour)	Note
X3	12	PS	230 V / 50 Hz phase
	13	N	
			<b>GENO-OSMO RO 125K-TS or AVRO 125 TS</b> Actuation only integrated booster pump via relay K2, fuse protection by fuse F3 (T 3,15 A) <b>GENO-OSMO RO 125K-TL or AVRO 125/TL</b> • Actuation of pressure booster pump voltage-free contact: Relay K2, terminals 21-24 • Control voltage for external power unit 230 V~: Relay K2, terminals 14-A2
	14	HP	
	13	N	
	14	HP	
X4	2	N	Neutral conductor
			230 V / 50 Hz phase
X5	15	COM	Common root
	16	SAMS	Fault signal contact
X6	17	MELD	Signal contact
X7	28	GND	Common ground (brown)
	29	WZ0	Pulse input permeate
	30	WZ1	Pulse input concentrate
	31	WZ2	Option: Pulse input blending unit
	32	+12V	Common transmitter voltage 12 VDC (white)
X8	33	+	Electrode cable AVRO
	34	GND	
			1
			2
X9	15	COM	Common root
	16	SAMS	Fault signal contact
	17	MELD	Signal contact
X10	28	GND	Common ground (brown)
	29	WZ0	Pulse input permeate
	30	WZ1	Pulse input concentrate
	31	WZ2	Option: Pulse input blending unit
X11	32	+12V	Common transmitter voltage 12 VDC (white)
X12	24	LEVEL A	Switch-off level high-pressure pump
	25	LEVEL B	Switch-on level high-pressure pump
	26	LEVEL C	Dry-run protection pressure booster pump
	27	+24V	Common transmitter voltage 24 VDC
X13			

Terminal no.	Terminal	Function (core colour)	Note
X8	18	DS_HP	Pressure switch high-pressure pump
	19	+24V	Transmitter voltage 24 VDC
	20	DS_PS	Pressure switch pressure booster pump
	21	+24V	Transmitter voltage 24 VDC
	22	CLOSE	Release input close
	23	+24V	Transmitter voltage 24 VDC
X9	35	Shielding	Conductive 2-electrode measuring cell, not temperature-compensated, cell constant 0.1 or 1.0
	36	LF E	White
	37	LF V	Brown
Relay K1	31 34	Release signal/start of analysis Hardness control monitoring device	Contact is closed when system is producing permeate. GENO-Softwatch Komfort: connect to terminals 16/17.

Arrangement of the components on the mounting rails, accessible after removal of the control unit:

Protective grounding conductor, mounted underneath the two fuses F2 and F3.



Fig. D-4: Position of protective grounding conductor terminal

## E Start-up



The work described below is only allowed to be performed by trained experts. We recommend having Grünbeck's technical service/authorised service company start up the system.

### 1 | How to flush the system



**Note:** For the duration of storage and transport, the membrane is protected by means of a preserving agent. This preserving agent must be flushed out before the initial start-up takes place. In order to prevent the system from being switched on beforehand, it is locked electronically.

#### 1.1 Mounting the flushing line

Disassemble the permeate line from the collection tank (refer to figs. E-1, E-2 no. 1) and route it to the drain in a separate hose.

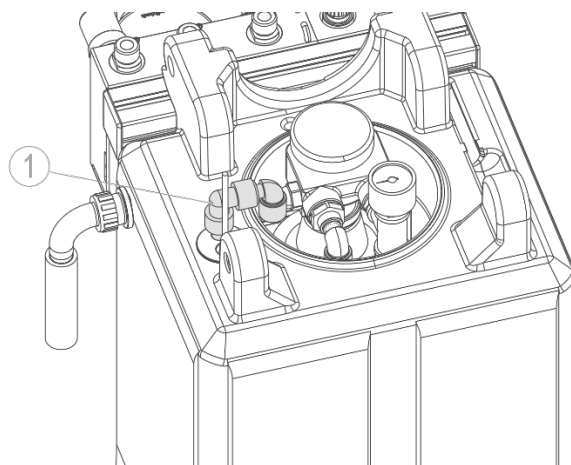


Fig. E-1: Permeate line AVRO TS

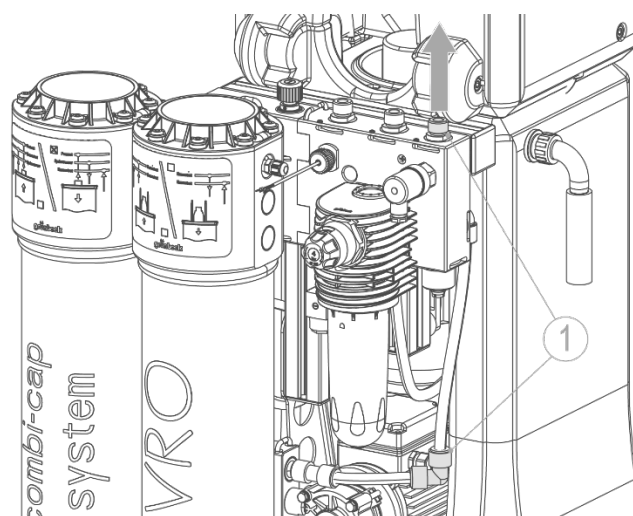


Fig. E-2: Permeate line AVRO-TL

## 1.2 Flushing out preserving agent



**Note:** For more detailed information on the handling of the control unit, refer to chapter F.


- Release the system via code 113, (refer to Table E-1: Extract from...), parameter ECL: To do this, open parameter with the P button, use the ▼ button to set ECL: 1 and confirm with the P button
- Open both solenoid valves ("DEAERATE") via code 113, (refer to Table E-1: Extract from...), parameter EnL: 1 and flush the preserving agent from the system for 30 minutes. To do so, open the parameter with the ▲ button, use the P button to set EnL: 1 and confirm with the P button
- Terminate the "DEAERATE" program step: Open parameter with the P button, set EnL:0 with the ▼ button and confirm with the P button
- Exit the "EnL" program by pressing the buttons ▼ and ▲ at the same time

Table E-1: Extract from point F-3.1 input logic code 113

Display factory setting	Parameter	Setting range	Comments
E-A: 1	Contact type level "a"	0 ... 1	0 = NO contact 1 = NC contact
E-b: 0	Contact type level "b"	0 ... 1	0 = NO contact 1 = NC contact
E-c: 0	Contact type level "c"	0 ... 1	0 = NO contact 1 = NC contact
EHP: 2	Type of contact pressure switch (high-pressure pump).	0 ... 3	0 = NO contact 1 = NC contact 2 = NO contact with auto restart <sup>1)</sup> 3 = NC contact with auto restart <sup>1)</sup>
EPS: 0	Contact type pressure switch PS (pressure booster pump).	0 ... 1	0 = NO contact 1 = NC contact
ECL: 0	Contact type close input.	0 ... 1	0 = NO contact 1 = NC contact
EnL: 0	Flushing the system (inlet and flushing solenoid valves).	0 ... 1	1 = Open solenoid valves (only possible if the system is switched off using ▼ button). 0 = Close solenoid valves again
A.PF:0	Function signal contact terminals 15/17.	0 ... 1	0 = Contact opens when HP pressure switch has dropped out, conductivity pre-warning, level has fallen below level "c", maintenance interval expired. 1 = Contact closed when HP pump running.



### 1.3 Venting permeate output / pressure booster pump

- Reinstall permeate line on collection tank (refer to fig. E-1).
- Switch on the reverse osmosis system by pressing button  . The system produces permeate in the tank.



**Note:** Below only for reverse osmosis system AVRO 125 TS.

- Let the system produce for 15 minutes (approx. 30 litres permeate)
- The pressure booster pump is vented when permeate flows out of the venting/sample valve (refer to fig. E-3, no. 1). Close the vent valve.
- Connect the plug of the pressure switch (refer to fig. E-4, no. 1) to the pressure switch – the pressure booster pump starts to deliver. In order to vent the connecting line of the reverse osmosis system (on-site piping), slightly loosen the union nut until the air has escaped.



**Note:** For the booster pump to reach its cut-off pressure, the downstream line must also be vented. Therefore, it is imperative to establish permeate consumption.

- Switch-on pressure approx. 1.8 bar; switch-off pressure approx. 3.0 bar.

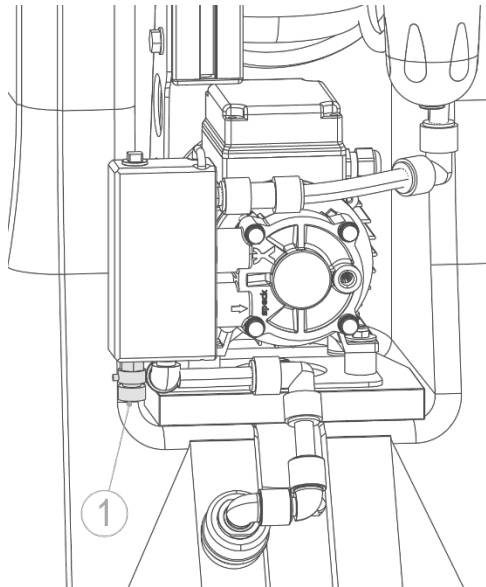


Fig. E-3: Venting pressure booster

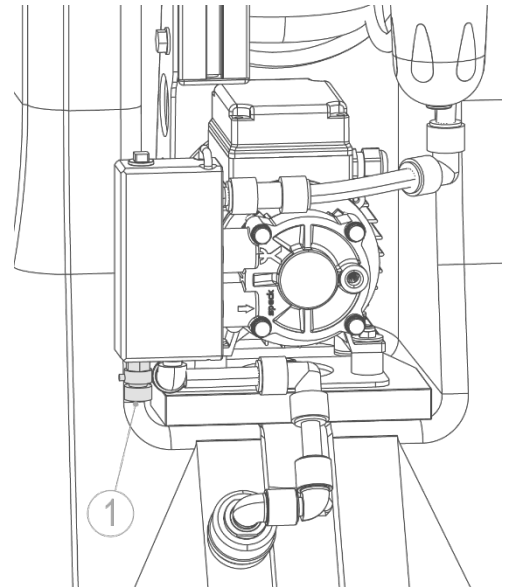


Fig. E-4: Pressure switch pressure booster

## F Operation

### 1 | Preface



**Note:** Instructions in bold are absolutely essential to ensure that work can continue. All other instructions can be ignored if the value shown on the display remains unchanged.



Settings in the technical service programming level are only allowed to be made by Grünbeck's technical service/authorised service company or by persons expressly authorised by Grünbeck.



**Warning!** Incorrect settings can lead to hazardous operating conditions which cause injury, illness or damage to property. Strictly adhere to the operation manual! Only make the settings described there!

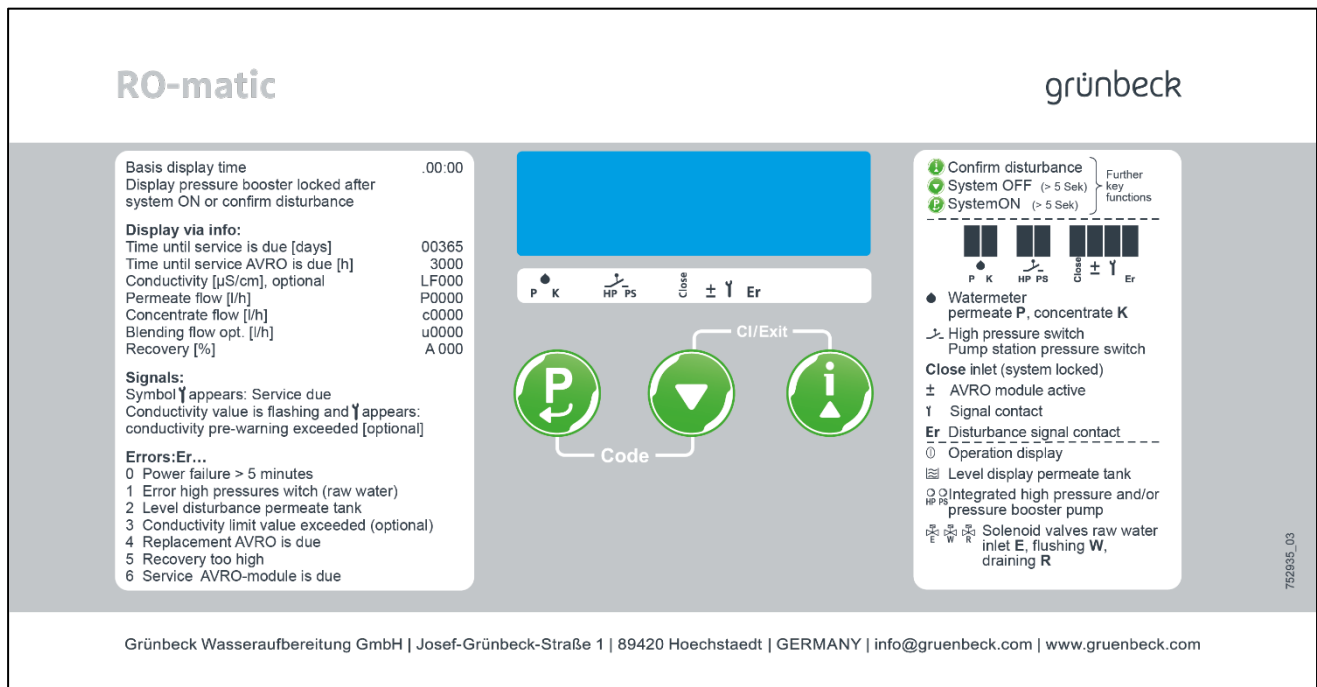












Fig. F-1: Control unit

## 2 | How to operate the control unit

### Display symbols:

	Operating display Appears when the system is switched on using the ▲ button (> 5 s from basic time display).
	High-pressure pump Appears when the high-pressure pump produces permeate.
	Booster pump Appears when the pressure booster pump is pumping permeate or when the power unit K2 is active.
	Inlet solenoid valve Appears when permeate is being produced, or when the system is flushing.
	Flushing solenoid valve Appears when the system is flushing.
	Solenoid valve forced withdrawal Appears when the permeate tank is emptied to the drain.
	Level indicator permeate tank Upper wave: Switch-off level for high-pressure pump. Middle wave: Switch-on level for high-pressure pump. Lower wave: Dry-running protection for pressure booster pump.
	Bars for water meter pulses Flash with every 5th pulse of the water meter permeate or concentrate.
	Bars for operational readiness of high-pressure pump (HP) and pressure booster pump (PS) Shows the status of the feed water inlet pressure switch (bar appears when pressure is active) and PS pump operation enable (bar appears when enabled).
	Bar for close input <ul style="list-style-type: none"> <li>Appears when the system is blocked because the on-site operational release is missing.</li> <li>Appears when HP pump is overheated.</li> </ul>

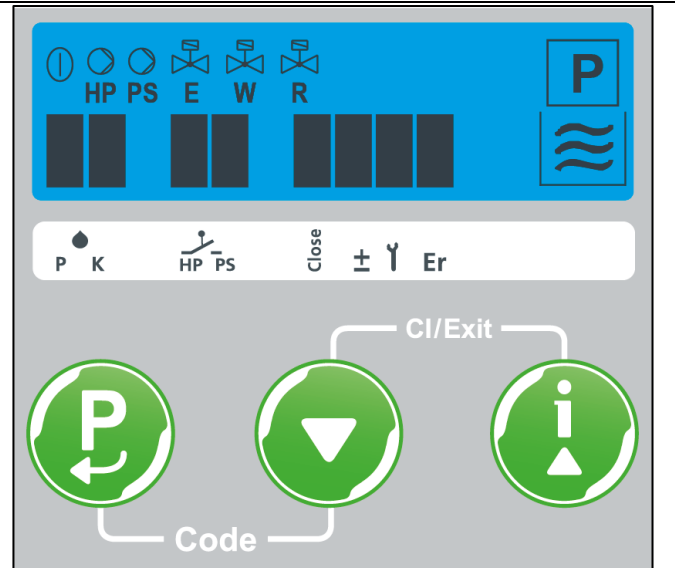












Fig. F-2: Operating panel control unit AVRO 125 TS/TL









	Numerical display <ul style="list-style-type: none"> <li>In the information level, indicates the time and operating parameters.</li> <li>Displays the parameters of the code levels.</li> <li>Displays symbols in addition to the error message.</li> </ul>
	Dot appears for as long as the pressure booster pump is blocked (after ON using ▲ button, after exceeding the lower wave permeate tank, acknowledge after malfunction).
	Flashes when the pressure switch for high-pressure pump drops out during permeate production (lack of feed water pressure)
	Bars for signal and fault signal contact Y appears when the maintenance interval has expired, high-pressure pump pressure switch failed, conductivity pre-alarm, permeate tank empty. Er appears in the event of malfunctions Er 0 ... Er 6.
	Bar appears when AVRO treatment module is active (always at the same time as high-pressure pump).

### Button functions:

Basic function:	Expanded function in programming levels:
 <ul style="list-style-type: none"> <li>Acknowledge malfunctions</li> <li>Access to time programming (press and hold button &gt; 2.5 s)</li> </ul>	<ul style="list-style-type: none"> <li>Open parameters for editing (value is shown flashing)</li> <li>Save and close parameters</li> </ul>
 Switch off system (> 5 s in basic time display)	<ul style="list-style-type: none"> <li>Reduce numerical value</li> <li>Return to the previous menu item</li> </ul>
 Switch on system (> 5 s in basic time display), display operating values of the information level	<ul style="list-style-type: none"> <li>Increase numerical value</li> <li>Switch to the next menu item</li> </ul>
 <b>Access to the code-protected programming levels (code request C 000)</b>	
	<ul style="list-style-type: none"> <li>Close the opened parameters without saving (previous value is maintained)</li> <li>Return to the basic time display</li> </ul>

### 2.1 Reading the operating status

Various operating parameters can be displayed in the information level. The information level is accessed by pressing the ▲ button (> 5 s). The other parameters are accessed by touching. The information level remains locked for as long as the system has not been enabled using the close input signal.

Button	Display	Parameter
	00:00	Basic time display
	The system might still be switched on with the first press (> 5 s)!	
	365	Remaining duration of the service interval [days]
	3000	Remaining time AVRO maintenance interval [operating hours]
	LF022	Permeate conductivity [ $\mu$ S/cm] (optional – display value flashes if the advance warning value is exceeded)
	P0200	Permeate flow rate [l/h]
	c0200	Concentrate flow [l/h]
	u0320	Flow rate blending [l/h] (option 752 800)
	A 050	System recovery [%]

### 2.2 How to set the time

#### Requirement:

Basic time display is currently being displayed.

1. Press the P button > 2.5 seconds, only the hours are still displayed 00:
2. Press the P button to change the hours (value is flashing, now set the desired value with the ▼ or ▲ button and save with the P button)  
or  
press the ▲ button to advance to the minutes :00.
3. Press the P button to change the minutes (value is flashing, now set the desired value with the ▼ or ▲ button and save with the P button).
4. Return to the basic display time by simultaneously pressing ▼ and ▲ buttons.

### 2.3 Access to the programming levels – change parameters

1. Simultaneously pressing the P and ▼ button (> 1 s) causes the code request C 000 to appear.
2. Set the required code with ▼ or ▲ button and confirm with the P button.
3. Within the programming level, select the desired parameter with the ▼ or ▲ button and open it for editing with the P button (value starts flashing).
4. Use the ▼ or ▲ button to change the parameter to the required value.
5. Save the new parameter setting with the P button (value stops flashing) or reject the change by simultaneously pressing the ▼ and ▲ buttons, and close the parameter again (value stops flashing, previous setting remains saved).
6. Return to the basic display time by simultaneously pressing the ▼ and ▲ buttons.
7. If no button is pressed within a parameter level for more than 5 minutes, the display automatically returns to the basic time display. Any open parameters (flashing value) are closed and the value stored up to now is maintained.

### 2.4 Software version

Display	Parameter
P1.00	Software version of the RO-matic control unit

### 3 | Programming levels


#### 3.1 Input logic code 113

Display factory setting	Parameter	Setting range	Comments
E-A: 1	Contact type level "a"	0 ... 1	0 = NO contact 1 = NC contact
E-b: 0	Contact type level "b"	0 ... 1	0 = NO contact 1 = NC contact
E-c: 0	Contact type level "c"	0 ... 1	0 = NO contact 1 = NC contact
EHP: 2	Type of contact pressure switch negative pressure HP (high-pressure pump).	0 ... 3	0 = NO contact 1 = NC contact 2 = NO contact with auto restart 1) 3 = NC contact with auto restart 1)
EPS: 0	Contact type pressure switch PS (pressure booster pump).	0 ... 1	RO/AVRO 125-TS: 0 = Normally open contact RO/AVRO 125-TL: 0 = Normally open contact + jumper Terminals 20/21 or 1 = Normally closed contact
ECL: 0	Contact type close input.	0 ... 1	0 = NO contact 1 = NC contact
EnL: 0	Flushing the system (inlet and flushing solenoid valves).	0 ... 1	1 = Open solenoid valves (only possible if the system is switched off using ▼ button). 0 = Close solenoid valves again.
A.PF:0	Function signal contact terminals 15/17.	0 ... 1	0 = Contact opens when HP pressure switch is deenergised, conductivity pre- warning, level has fallen below "c", maintenance interval expired. 1 = Contact closed when HP pump running.

1) If fault Er 1 occurs when permeate production is in progress (high-pressure pump negative pressure switch), the system causes a new start in at the following time intervals:

5 ... 10 ... 20 ... 40 ... 80 ... 160 minutes.


If there is sufficient pressure available, permeate is produced until level "a" is reached, and the error is self-acknowledging.

The symbol  flashes on the display in the waiting time between the start attempts

2) Pressure switch:    Switch-on pressure 1.8 bar  
                              Switch-off pressure 3.0 bar

The hysteresis of the pressure switch can be adjusted in parallel with the central screw of the switch.

### 3.2 System parameters code 290

Display / factory setting	Parameter	Setting range	Comments
1. 0	Cell constant conductivity measurement (optional).	0.0 / 0.1 / 1.0	0.0 = Conductivity measurement deactivated, i.e. parameter 2 ... 4 in-active 0.1 = Measurement range 0 ... 99 $\mu\text{S/cm}$ 1.0 = Measurement range 0 ... 999 $\mu\text{S/cm}$
2. 080	Conductivity limit value for fault Er 3 [ $\mu\text{S/cm}$ ].	1 ... 999	 <b>Note:</b> Set value must be selected appropriate for the cell constant (i.e. measuring range)!
3. 070	Conductivity advance warning [ $\mu\text{S/cm}$ ] (display in the information level starts to flash and signal contact switches).	1 ... 999	
4. 05	Switch-off delay with Er 3 [minutes].	0 ... 99	Also delay time for outputting the signal message when the conductivity advance warning is exceeded.
5. 0	Mains return reaction for fault Er 0 (mains failure > 5 minutes).	0 ... 2	0 = Irrespective of whether the system was switched off or on before the mains failure, it remains switched off after the mains returns and fault Er 0 is output. 1 = Fault Er 0 is deactivated. 2 = After the mains power returns, the system is switched off or on as it was before the mains failure, and fault Er 0 is output.



Display / factory setting	Parameter	Setting range	Comments
6. 1	Daily interval for forced operation / forced withdrawal [days].	1 ... 3	If the day interval since the last permeate output has been reached at the programmed time, forced operation or forced withdrawal takes place – depending on what is activated. <b>For AVRO 125 TS, only forced withdrawal is permitted in conjunction with the solenoid valve forced withdrawal option!</b>
7.18:00	Time forced operation / forced withdrawal.	00:00 ... 23:59	
8. 0	Duration forced operation [hours].	0 ... 9	
9. 3.0	Opening time solenoid valve forced withdrawal [minutes].	0.0 ... 99.9	
A. 0	Recovery monitoring (Er 5).	0 ... 1	With AVRO 125 TS/TL the recovery monitoring must be activated!
b. 65	Upper recovery limit value [%].	1 ... 99	<b>Caution!</b> With AVRO 125 TS/TL, the recovery must be set to 50 %!
c. 060	Delay time for recovery deactivation [min.].	0 ... 240	

## 4 | Operation of reverse osmosis

### 4.1 How to set the system recovery

A certain part of the feed water must be rejected in order to prevent the membrane from clogging due to scaling. The ratio of the produced permeate volume to the feed water volume is called recovery.

#### 4.1.1 How to set the permeate volume

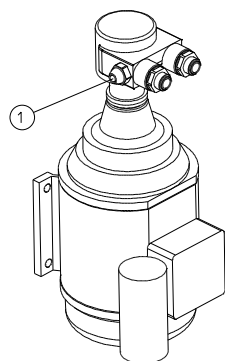


Fig. F-3: Pump

- Switch on the system at the control unit by pressing the "ON" button.
- Use the adjustment valve operating pressure (refer to fig. F-3, no. 1) to throttle the pump in such a way that the specific permeate flow rate 125 l/h is achieved.



**Note:** The current permeate flow can be displayed via the control unit (refer to chapter F, point 2.1 Reading the operating status).

### 4.1.2 How to set the concentrate volume

- Set the concentrate flow at the concentrate needle valve (refer to fig. F-4, no. 1).
- The concentrate flow in a standard system has to be set in a way, that a recovery of 50 % is attained (125 l/h of permeate flow, 125 l/h of concentrate flow).



**Note:** The current concentrate flow and the recovery can be displayed via the control unit (refer to chapter F, point 2.1 Reading the operating status).



**Caution!** If the recovery setting is not maintained, scaling (precipitation of dissolved salts) occurs on the reverse osmosis membrane.

- Measure water values of feed water, permeate, concentrate after 10 minutes and enter them in the operating log.
- Switch off system.

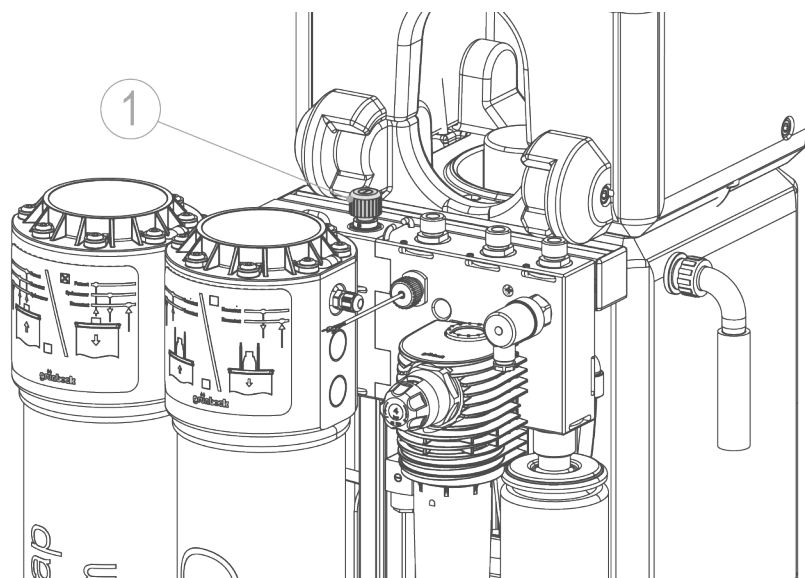


Fig. F-4: Hydro module

### Example for the calculation of the recovery

$$\text{Recovery [\%]} = \frac{\text{Permeate flow [l/h]} \times 100 \text{ \%}}{\text{Permeate flow [l/h]} + \text{Concentrate flow [l/h]}}$$

$$\text{Concentrate flow [l/h]} = \frac{\text{Permeate flow [l/h]} \times 100}{\text{Concentrate recovery [\%]}} - \text{Permeate flow [l/h]}$$

## G Troubleshooting

Even carefully designed and manufactured technical systems that are operated properly, can experience malfunctions. Table G-1 provides an overview of possible problems that can occur during the operation of the systems and indicates the causes and their elimination.

The systems are equipped with an error detection and reporting system. If an error message is displayed:

1. Press P button (= acknowledge malfunction).
2. Watch the display.  
If the message reappears, compare it with table G-1.
3. If necessary, notify Grünbeck's technical service.





**Note:** In the case of malfunctions which cannot be remedied with the information in Table G-1, it is essential to contact the customer service (refer to [www.gruenbeck.de](http://www.gruenbeck.de))! Enter the system designation, serial number and, if necessary, fault signal in the display.

**Table G-1: Troubleshooting**

This is what you observe	This is the cause	This is what to do
Water quality deteriorated by 50 %.	Membrane clogged.	Replace or flush the membrane <sup>1)</sup> .
	Feed water values deteriorated.	Check feed water values.
Solenoid valve does not <b>open</b> .	Coil defective or fuse on the circuit board blown.	Replace coil or fuse.
Solenoid valve does not <b>close</b> .	Valve contaminated.	Clean valve.
Bar appears in the display above Symbol Close.	<ul style="list-style-type: none"> <li>HP pump: Thermostat contact has responded, pump has overheated.</li> <li>Upstream hardness monitoring or water treatment blocks the system.</li> </ul>	<ul style="list-style-type: none"> <li>Wait until the pump has cooled down again, the system will then automatically continue to produce.</li> <li>Inspect system installed upstream.</li> </ul>
Bar appears in the display above screw wrench symbol (without further indications of a malfunction).	Service interval has elapsed.	Have maintenance performed.

Continuation Table G-1: Troubleshooting

This is what you observe	This is the cause	This is what to do
Conductivity measured value in information level is shown flashing and bar appears in the display over spanner symbol.	Optional conductivity measurement: Conductivity pre-warning part F / chapter 3.2 / parameter 4 has been exceeded.	Check feed water values and flush the membrane, if necessary.
Er 0	Power failure > 5 minutes Refer to part F / chapter 3.2 / parameter A: Depending on the setting, the system continues operating or remains switched off	Check power supply for failures
Er 1	Pressure loss at pressure switch HP: Refer to part F / chapter 3.1 / parameter EHP: Depending on the setting, the system had 6 previous unsuccessful start attempts	Re-establish feed water primary pressure
Er 2	Invalid level setting in the permeate tank	Check wiring or setting in code 113, parameters E-A, E-b and E-c and correct if necessary (NC/NO contact assignment)
Er 3	Optional conductivity measurement: Conductivity limit value Part F / chapter 3.2 / parameter 3 has been exceeded	Check feed water values, flush membrane and replace, if necessary
Er 4	Minimum AVRO treatment current undershot	Have the AVRO treatment module replaced immediately by Grünbeck's technical service/authorised service company
Er 5	System recovery too high	Gauge and reset the system
Er 6	AVRO maintenance interval has elapsed	Notify Grünbeck's technical service/authorised service company to have the AVRO treatment module replaced promptly
Symbol  flashes (from software V1.22 onwards) or symbol  flashes (up to software V1.19)	See Er 1: Waiting time runs between 2 start attempts	Re-establish feed water primary pressure

<sup>1)</sup> Separate flushing instructions for membranes are available for authorised service personnel under order no. 700 950.

## H Maintenance and care

### 1 | Basic information

In order to guarantee the reliable function of the systems over a long period of time, some maintenance work has to be performed at regular intervals. All regulations and guidelines which apply at the installation site must be strictly adhered to.

- Check the quality and the system volume flows every day.
- Maintenance has to be performed by Grünbeck's technical service/authorised service company or by a specialised company. Maintenance is subject to the load, but at the latest has to be performed once a year.
- An operation log and the corresponding test log must be kept in order to document the maintenance work performed.



**Note:** By concluding a maintenance contract you ensure that all maintenance work will be performed in due time.

The maintenance work performed must be documented in the checklist, refer to appendix "Operation log".

### 2 | Inspection (functional check)

You can perform the daily inspections yourself.

Please refer to the following summary for the tasks to be performed within the framework of an inspection.

#### **Summary: Inspection work**

- Determine inlet water values.  
(Water test kit "total hardness" or carbonate hardness).
- Determine the permeate quality. Either at the display if a conductivity monitoring device is installed or by means of a manual conductivity meter.
- Read the recovery.



**Note:** Minor deviations are normal and cannot be prevented technically. In case of considerable deviations from the standard, notify Grünbeck's technical service.

- Take the remaining time of AVRO treatment unit's maintenance interval into consideration (refer to chapter F, point 2.1). If the remaining time is < 100 hours, notify Grünbeck's technical service/authorised service company to have the treatment module replaced.
- Take the remaining time of the maintenance interval into consideration. (Chapter F - point 2.2 Reading the operating state). In case the remaining time of the maintenance interval is < 30 days, inform Grünbeck's technical service about the impending service.

- Make sure that there are no leakages from the system to the drain (all 3 waves can be seen on the display when the system is switched off (refer to fig. F-2, point 5). Solenoid valves are not tightened, visible in the display (refer to fig. F-2, no. 9 and 10). In this state, no water must creep to the drain.



**Note:** There can be increased water consumption by the system if the solenoid valves are leaking. The recovery will be reduced.

### 3 | Maintenance



According to DIN 1988 part 8 / A 12, maintenance work at the systems is only allowed to be performed by Grünbeck's technical service/authorised service company or an approved specialist company.

For this kind of systems, an operation log - a checklist has to be kept. In this operation log, the customer service technician records all maintenance and repair work performed. In case of malfunctions, this log helps to identify possible sources of error. In addition, the log documents the proper system maintenance.



**Note:** Make sure that all maintenance work is recorded in the operation log as well as in the corresponding test report.

#### Summary: Maintenance work

- Replace filter elements.
- If necessary, replace the filter element of the activated carbon filter.
- Check the permeate quality; flush or replace the membrane, if necessary. So-called flushing instructions (order no. 700 950) are available for authorised service personnel.
- Replacement of AVRO treatment unit, if necessary (limit value: 3000 h or 5 years).
- Clean the solenoid valves - check their function.
- Check the flow volumes and recalibrate the water meter.
- Check the state of the entire system and check for tightness.
- Mechanical resp. electrical functional and performance check of all aggregates (pumps, valves).
- Prepare a written maintenance log on the state and function of the system and the maintenance work performed, incl. evaluation and assessment of the operating values and water analysis results.



**Note:** The maintenance work performed must be documented in the checklist, refer to appendix "Operation log"

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### 3.1 Operation log

The operation log is located in chapter H, point 4 of this operation manual. When starting up the system, make sure to record all data on the cover sheet of the operation log and fill in the first column of the checklist.

The customer service technician will fill in a column of the check list whenever maintenance is performed. This document provides evidence of proper maintenance.

## 4 | Operation log

### Customer

Name:.....

Address: .....

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### Reverse osmosis system AVRO 125

(Please check appropriate box)

TL	<input type="checkbox"/>
TS	<input type="checkbox"/>

Serial number.....

Installed by .....

Drinking Water Filter: Make/type... / .....

System separator: Make/type ..... / .....

Activated carbon filter: Make/type . / .....

Fine Filter : Make/type..... / .....

### Connection data:

(Please check appropriate box)

Drain connection DIN 1988 ☐ yes ☐ no

Floor drain available ☐ yes ☐ no

Line before ☐ Galvanised

AVRO 125 TS/TL ☐ Copper

☐ Plastic

☐ .....

Height of drain . . . . . cm from bottom edge of the system



## Maintenance work on reverse osmosis system AVRO 125 TS/TL Checklist

Please enter measured values. Confirm checks with OK or enter repair work performed.

<input type="checkbox"/> Maintenance performed <b>without</b> replacement of module	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of module Module no.....	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of AVRO treatment module Treatment module no.....
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### Measured values

Water volumes and water qualities **before** the replacement of the module / **after** the replacement of the module or in case of maintenance

Pump pressure [bar]	Conductivity [µS/cm]	Total hardness [°dH] <sup>1)</sup>	Carbonate hardness [°cH] <sup>2)</sup>	Temperature [°C]	Volume flow [l/h]	Recovery [%]
before/after	before/after	before/after	before/after	before/after	before/after	before/after
/						
Feed water	/	/	/	/	/	
Permeate	/	/	/	/	/	
Concentrate	/	/	/	/	/	..... % / ..... %

	Acknowledgement	Remarks
Water meter reading upstream of the system [m³]		
Inlet water pressure (2.5 - 4 bar) checked		
Filter elements replaced		
Settings of electronics checked		
Remaining AVRO maintenance interval (chapter F 2.1) [h]		
Operating hours (chapter F, 2.1)		
Run time of high-pressure pump (code 245, par. c) [h]		
Run time of pressure booster pump (code 245, par. d) [h]		
Permeate volume produced (code 245, par. E) [m³]		
Concentrate volume generated (code 245, par. F) [m³]		
Blended water quantity (code 245, par. G) [m³]		
AVRO treatment current intensity (code 245, par. I) [mA]		
Error memory (code 245, par. 1..9) [Er]		

<sup>1)</sup> 1°dH = 1.78°f = 0.178 mmol/l

<sup>2)</sup> 1°cH = 0.36 mmol/l

	Acknowledgement	Remarks
All electrical lines checked for external damage		
All hoses and connections checked for external damage		
Inlet and flushing solenoid valve checked for leaks – cleaned if necessary		
Pressure switch of high-pressure pump checked for function		
Pressure switch – switching hysteresis		
Pressure booster checked/adjusted		
Conductivity sensor checked/cleaned		
Visual check of electronics board		
System checked for tightness		
Load units reset		

### Miscellaneous

Remarks: .....

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Start-up technician / TS technician:.....

Company: .....

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Work time certificate (no.): .....

Date/signature .....

## Maintenance work on reverse osmosis system AVRO 125 TS/TL Checklist

Please enter measured values. Confirm checks with OK or enter repair work performed.

<input type="checkbox"/> Maintenance performed <b>without</b> replacement of module	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of module Module no.....	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of AVRO treatment module Treatment module no.....	
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### Measured values

Water volumes and water qualities **before** the replacement of the module / **after** the replacement of the module or in case of maintenance

Pump pressure [bar]	Conductivity [μS/cm]	Total hardness [°dH] <sup>1)</sup>	Carbonate hardness [°cH] <sup>2)</sup>	Temperature [°C]	Volume flow [l/h]	Recovery [%]
before/after	before/after	before/after	before/after	before/after	before/after	before/after
/						
Feed water	/	/	/	/	/	
Permeate	/	/	/	/	/	
Concentrate	/	/	/	/	/	..... % / ..... %

	Acknowledgement	Remarks
Water meter reading upstream of the system [m³]		
Inlet water pressure (2.5 - 4 bar) checked		
Filter element replaced (80 μm / 5 μm)		
Settings of electronics checked		
Remaining AVRO maintenance interval (chapter F 2.1) [h]		
Operating hours (chapter F, 2.1)		
Run time of high-pressure pump (code 245, par. c) [h]		
Run time of pressure booster pump (code 245, par. d) [h]		
Permeate volume produced (code 245, par. E) [m³]		
Concentrate volume generated (code 245, par. F) [m³]		
Blended water quantity (code 245, par. G) [m³]		
AVRO treatment current intensity (code 245, par. I) [mA]		
Error memory (code 245, par. 1..9) [Er]		

<sup>1)</sup> 1°dH = 1.78°f = 0.178 mmol/l

<sup>2)</sup> 1°cH = 0.36 mmol/l

	Acknowledgement	Remarks
All electrical lines checked for external damage		
All hoses and connections checked for external damage		
Inlet and flushing solenoid valve checked for leaks – cleaned if necessary		
Pressure switch of high-pressure pump checked for function		
Pressure switch – switching hysteresis		
Pressure booster checked/adjusted		
Conductivity sensor checked/cleaned		
Visual check of electronics board		
System checked for tightness		
Load units reset		

### Miscellaneous

Remarks: .....

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Start-up technician / TS technician:.....

Company: .....

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Work time certificate (no.): .....

Date/signature .....

## Maintenance work on reverse osmosis system AVRO 125 TS/TL Checklist

Please enter measured values. Confirm checks with OK or enter repair work performed.

<input type="checkbox"/> Maintenance performed <b>without</b> replacement of module	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of module Module no.....	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of AVRO treatment module Treatment module no.....	
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### Measured values

Water volumes and water qualities **before** the replacement of the module / **after** the replacement of the module or in case of maintenance

Pump pressure [bar]	Conductivity [μS/cm]	Total hardness [°dH] <sup>1)</sup>	Carbonate hardness [°cH] <sup>2)</sup>	Temperature [°C]	Volume flow [l/h]	Recovery [%]
before/after	before/after	before/after	before/after	before/after	before/after	before/after
/						
Feed water	/	/	/	/	/	
Permeate	/	/	/	/	/	
Concentrate	/	/	/	/	/	..... % / ..... %

	Acknowledgement	Remarks
Water meter reading upstream of the system [m³]		
Inlet water pressure (2.5 - 4 bar) checked		
Filter element replaced (80 μm / 5 μm)		
Settings of electronics checked		
Remaining AVRO maintenance interval (chapter F 2.1) [h]		
Operating hours (chapter F, 2.1)		
Run time of high-pressure pump (code 245, par. c) [h]		
Run time of pressure booster pump (code 245, par. d) [h]		
Permeate volume produced (code 245, par. E) [m³]		
Concentrate volume generated (code 245, par. F) [m³]		
Blended water quantity (code 245, par. G) [m³]		
AVRO treatment current intensity (code 245, par. I) [mA]		
Error memory (code 245, par. 1..9) [Er]		

<sup>1)</sup> 1°dH = 1.78°f = 0.178 mmol/l

<sup>2)</sup> 1°cH = 0.36 mmol/l

	Acknowledgement	Remarks
All electrical lines checked for external damage		
All hoses and connections checked for external damage		
Inlet and flushing solenoid valve checked for leaks – cleaned if necessary		
Pressure switch of high-pressure pump checked for function		
Pressure switch – switching hysteresis		
Pressure booster checked/adjusted		
Conductivity sensor checked/cleaned		
Visual check of electronics board		
System checked for tightness		
Load units reset		

### Miscellaneous

Remarks: .....

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Start-up technician / TS technician:.....

Company: .....

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Work time certificate (no.): .....

Date/signature .....

## Maintenance work on reverse osmosis system AVRO 125 TS/TL Checklist

Please enter measured values. Confirm checks with OK or enter repair work performed.

<input type="checkbox"/> Maintenance performed <b>without</b> replacement of module	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of module Module no.....	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of AVRO treatment module Treatment module no.....	
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### Measured values

Water volumes and water qualities **before** the replacement of the module / **after** the replacement of the module or in case of maintenance

Pump pressure [bar]	Conductivity [μS/cm]	Total hardness [°dH] <sup>1)</sup>	Carbonate hardness [°cH] <sup>2)</sup>	Temperature [°C]	Volume flow [l/h]	Recovery [%]
before/after	before/after	before/after	before/after	before/after	before/after	before/after
/						
Feed water	/	/	/	/	/	
Permeate	/	/	/	/	/	
Concentrate	/	/	/	/	/	..... % / ..... %

	Acknowledgement	Remarks
Water meter reading upstream of the system [m³]		
Inlet water pressure (2.5 - 4 bar) checked		
Filter element replaced (80 μm / 5 μm)		
Settings of electronics checked		
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Operating hours (chapter F, 2.1)		
Run time of high-pressure pump (code 245, par. c) [h]		
Run time of pressure booster pump (code 245, par. d) [h]		
Permeate volume produced (code 245, par. E) [m³]		
Concentrate volume generated (code 245, par. F) [m³]		
Blended water quantity (code 245, par. G) [m³]		
AVRO treatment current intensity (code 245, par. I) [mA]		
Error memory (code 245, par. 1..9) [Er]		

<sup>1)</sup> 1°dH = 1.78°f = 0.178 mmol/l

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Pressure switch – switching hysteresis		
Pressure booster checked/adjusted		
Conductivity sensor checked/cleaned		
Visual check of electronics board		
System checked for tightness		
Load units reset		

### Miscellaneous

Remarks: .....

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Start-up technician / TS technician:.....

Company: .....

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Work time certificate (no.): .....

Date/signature .....



## Maintenance work on reverse osmosis system AVRO 125 TS/TL Checklist

Please enter measured values. Confirm checks with OK or enter repair work performed.

<input type="checkbox"/> Maintenance performed <b>without</b> replacement of module	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of module Module no.....	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of AVRO treatment module Treatment module no.....	
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### Measured values

Water volumes and water qualities **before** the replacement of the module / **after** the replacement of the module or in case of maintenance

Pump pressure [bar]	Conductivity [μS/cm]	Total hardness [°dH] <sup>1)</sup>	Carbonate hardness [°cH] <sup>2)</sup>	Temperature [°C]	Volume flow [l/h]	Recovery [%]
before/after	before/after	before/after	before/after	before/after	before/after	before/after
/						
Feed water	/	/	/	/	/	
Permeate	/	/	/	/	/	
Concentrate	/	/	/	/	/	..... % / ..... %

	Acknowledgement	Remarks
Water meter reading upstream of the system [m³]		
Inlet water pressure (2.5 - 4 bar) checked		
Filter element replaced (80 μm / 5 μm)		
Settings of electronics checked		
Remaining AVRO maintenance interval (chapter F 2.1) [h]		
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System checked for tightness		
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### Miscellaneous

Remarks: .....

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Start-up technician / TS technician:.....

Company: .....

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Work time certificate (no.): .....

Date/signature .....

## Maintenance work on reverse osmosis system AVRO 125 TS/TL Checklist

Please enter measured values. Confirm checks with OK or enter repair work performed.

<input type="checkbox"/> Maintenance performed <b>without</b> replacement of module	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of module Module no.....	<input type="checkbox"/> Maintenance performed <b>with</b> replacement of AVRO treatment module Treatment module no.....	
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### Measured values

Water volumes and water qualities **before** the replacement of the module / **after** the replacement of the module or in case of maintenance

Pump pressure [bar]	Conductivity [μS/cm]	Total hardness [°dH] <sup>1)</sup>	Carbonate hardness [°cH] <sup>2)</sup>	Temperature [°C]	Volume flow [l/h]	Recovery [%]
before/after	before/after	before/after	before/after	before/after	before/after	before/after
/						
Feed water	/	/	/	/	/	
Permeate	/	/	/	/	/	
Concentrate	/	/	/	/	/	..... % / ..... %

	Acknowledgement	Remarks
Water meter reading upstream of the system [m³]		
Inlet water pressure (2.5 - 4 bar) checked		
Filter element replaced (80 μm / 5 μm)		
Settings of electronics checked		
Remaining AVRO maintenance interval (chapter F 2.1) [h]		
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Run time of high-pressure pump (code 245, par. c) [h]		
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Permeate volume produced (code 245, par. E) [m³]		
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Blended water quantity (code 245, par. G) [m³]		
AVRO treatment current intensity (code 245, par. I) [mA]		
Error memory (code 245, par. 1..9) [Er]		

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Pressure switch – switching hysteresis		
Pressure booster checked/adjusted		
Conductivity sensor checked/cleaned		
Visual check of electronics board		
System checked for tightness		
Load units reset		

### Miscellaneous

Remarks: .....

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Start-up technician / TS technician:.....

Company: .....

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Work time certificate (no.): .....

Date/signature .....