BWT PERMAQ®
Pico 10-70

Reverse osmosis units

Pico on/off	10, 20, 30, 40, 50, 60, 70
Pico HR on/off	40, 50, 60, 70
Pico FT on/off	10, 20, 30, 40, 50, 60, 70
Pico Duo	20/10, 30/20, 50/40, 50, 60/50, 70/60

Read and observe: Please keep this Installation and Operating Manual (IOM) close at hand for quick reference to the unit's operation. Following the instructions in this manual will avoid hazards; the device will be operated reliably and economically. All legal claims are stated in our Terms and Conditions (GTC).

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For You and Planet Blue.

BWT BEST WATER TECHNOLOGY

Thank you very much for the confidence in us you have shown by purchasing a BWT appliance.

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1.1 Abbreviations and subject index

Softening:

The water purification process removes the hardness from raw water. Hardness constituents are the portion of calcium and magnesium ions in the water.

Anti-scalant dosing:

Anti-scalant (AS) – pre-treatment with anti-scalant dosage to obtain hardness stabilization.

NaOH dosing:

Dosage of sodium hydroxide for adjusting the pH value, so that CO_2 can be converted into the carbonate form and can therefore be retained by the RO.

Raw water:

Raw water (usually untreated drinking water) must often be pre-treated (usually softening) and is then useable for the desalination process in the RO device.

RO:

Abbreviation for Reverse Osmosis.

Permeate:

The largely desalinated "pure water" filtered in the RO membranes and generated by reverse osmosis. The characteristic value is the electric conductivity in µS/cm.

Concentrate:

Waste water led to outlet. This waste water contains the salts and minerals that have been removed from the raw water.

Membranes:

The "filter" of the device which is capable of desalinating the raw water by high pressure and flow.

HR:

"High retention" RO membranes for high TDS feed water.

TDS:

Abbreviation for "Total Dissolved Solids" the total amount of dissolved salts, measured in mg/l.

TOC:

Abbreviation for "Total Organic Carbon". The "TOC" value describes the total content of organic carbon in the raw water.

SDI:

Abbreviation for "Silt Density Index". The "Silt Density Index" is an indicator of the organic contamination of raw water. The measurement system is a filtration process which determines the blocking tendency, measured during 15 min.

Conductivity:

Electric conductivity value of the water, the smaller this measured value (µS/cm) the better the water quality.

IOM:

Abbreviation for "Installation and Operating Manual"

Permeate yield (WCF):

The ratio between the produced pure water (permeate) and the thus required amount of feed water (soft water) is expressed as permeate yield (WCF) or "Water Conversion Factor".

Online/offine configuration mode:

In the **online mode** the produced permeate is delivered to the consumer via a pressure reservoir without booster pump.

In the **offine mode** the produced permeate stored in a permeate tank and is delivered to the consumer via a booster pump. The permeate tank is monitored with an level contact (NO).

1.2 Manufacturer

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1.3 General comments

Following the instructions in this installation and operating manual (IOM) helps the operator to run the reverse osmosis BWT PERMAQ® Pico 10-70 reliably and economically. This installation and operating manual (IOM) is part of the device and must be constantly available at the place of operation for all staff members assigned.

Reading the Installation and Operating Manual (IOM):

The staff must have read and understood this IOM prior to any work being carried out. A basic precondition for safe working is the adherence to all stated safety and operating instructions.

In addition, the local accident prevention provisions and the general safety provisions effective at the place of operation are applicable. The illustrations in these instructions serve the basic understanding and can deviate from the actual design of the device. Justified claims cannot be derived from the same.

Warranty provisions and disclaimer:

Please observe: All of the information and instructions contained in this Installation and Operating Manual were provided in respect of current standards, regulations, prior art and our long-term experiences.

BWT excludes any responsibility for damages and for consequential loss due to:

- Non-compliance with the instructions in the manual;
- Any use not conforming to the intended purpose;
- Improper or faulty installation;
- Improper initial operation and operation, maintenance;
- Use of non-permitted components as well as non-original parts;
- Lack of examination in required service and maintenance work;
- Damage due to unauthorized modification and technical manipulation.

Licence conditions:

Qualified persons and users:

Please observe:
Stipulate clear staff responsibilities for operation, set-up, maintenance, repair work!

For installation, commissioning and maintenance/service work, it is mandatory that it be effected by skilled and instructed person. The user has to be trained by a BWT organisation or other authorised person to operate the RO device.

- **Trained and instructed staff:** Was instructed about all possible dangers due to improper use.
- **Qualified persons:** Are able to install, commission and service an RO unit due to their qualification, knowledge and experience in current regulations.

1.4 Explanation of safety symbols

This installation and operating manual uses **warnings/symbols!** The warnings/instructions are introduced by signal words **to underline risks**.

Please follow instructions and treat them with maximum importance to avoid any accidents and damages.

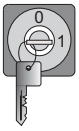
Danger: Caused by electric current or voltage!
Always consult a qualified electrician when working on places denoted by this symbol.

Attention: Dangerous spot!
Details or orders and prohibitions to avoid personal injury or extensive damage to property.

Please observe: Underlines useful recommendations and information for an efficient operation free of any interruptions.

Warning: Beware of harmful or irritating substances. Do not eat or drink.

Note: Additional information for the operator.



Key symbol: This (software) function is **password protected**.

Residual risks:

Principle: The reverse osmosis has been constructed in accordance with recognised, state of the art safety regulations. Nevertheless, its use might result in risks for life and health of users or third parties, or the impairment of the facility or other assets.

Danger caused by electric current or voltage!

→ Electrical installation should be performed by a licensed electrician.

→ National safety regulations (e.g. SEV, VDE, VBG4) as well as the relevant technical specifications have to be observed.

→ Always disconnect the voltage supply of the unit by removing the plug or fuse if hard wired during any maintenance and electrical work.

Attention:
Details or orders and prohibitions to avoid personal injury or extensive damage to property.
Observe the hydraulic and electrical requirements for installation and commissioning!

Never operate the device outside the defined operation conditions. Never exceed the defined maintenance and service intervals.

→ Misuse could cause malfunctions and safety failures.

Attention:
Never operate the device with the main housing covers removed.

Never cover the ventilation slots on the left as well as rear side of the units housing.

Observe:
Use only trained or instructed staff for installation, commissioning, operation, maintenance and and repair work. Furthermore has the operator to stipulate clear staff instructions and responsibilities.

Stipulate facility supervisor responsibility and permit supervisor to reject instructions of third parties not in line with safety regulations! The legal minimum age shall be observed!

Note: Protective installations, locks and couplings of the facility shall be inspected by an expert for safe conditions at regular intervals.

Inspection results shall be documented in an inspection certificate and kept until the next inspection.

Observe:
Prior to start up examine all supply connections (for energy and water) and ensure that they are correctly installed.

The operator must ensure that all installation, maintenance and service work is carried out by qualified technical personnel.

All repairs and service work are to be done regularly.

Spare parts shall conform to the technical requirements specified by the manufacturer.

Use only **genuine spare parts** to ensure safety and ongoing performance.

Observe: Only use the cleaning and disinfection chemicals **AQUARIS RM** and **AQUARIS DES**, which are recommended by BWT.

Do not use any aggressive cleaning agents! Other **inflammable solvents might ignite and injure** persons!

Storage: Store the cleaning and disinfection chemicals separately from foodstuffs, drinks and animal feed. Keep away from children!

Attention: Protective safety equipment!

Please wear the personal safety equipment in any case if cleaning agent is used: Please use personal protective equipment if required!

1) Please wear eye protection!
2) Please wear protection gloves!
3) Do not eat or drink while working!
4) Please carry out hand washing and care for skin thoroughly, after working with cleaning agents!

1.5 Differentiation of device types

BWT PERMAQ® Pico on/off
- Online- / offline operation

BWT PERMAQ® Pico HR
- High rejection, high performance membranes with a increased salt rejection

BWT PERMAQ® Pico Duo
- Two-stage reverse osmosis, consisting of: **Pico online**, **Pico offline** and corresponding of the hydraulic and electrical connection

BWT PERMAQ® Pico FT
- The reverse osmosis FT versions are available with **flowmeters** (raw water, permeate) and with a **concentrate regulating valve** equipped. The current flow rate and the "Water Conversion Factor" (WCF) are shown on the display.

Overview of configuration options BWT PERMAQ® Pico:

BWT PERMAQ® Pico / types 10-70:	on/off	HR on/off	on/off FT	HR on/off FT	Duo 20/10-70/60
Low pressure RO membranes	Yes	No	Yes	No	Yes
RO membranes with a high salt retention (HR)	No	Yes	No	Yes	No
Water flowmeter for feed water	No	No	Yes	Yes	No
Water flowmeter for permeate	No	No	Yes	Yes	No
Dosing system	OPTION	OPTION	OPTION	OPTION	OPTION

Note: *Pico Duo = consisting of 2 reverse osmosis units*

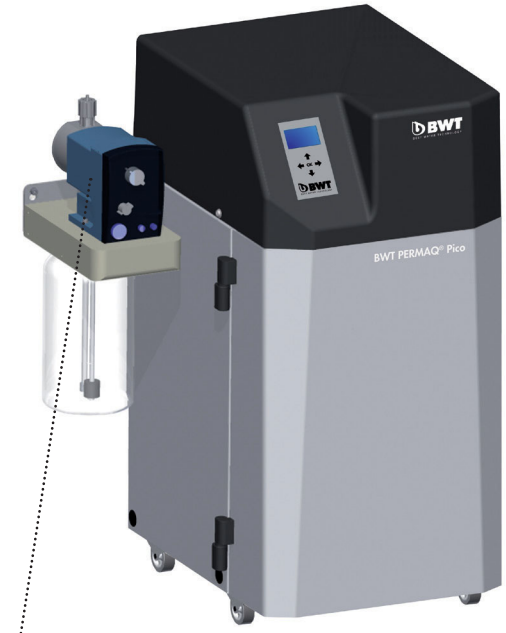


Fig. 1: *Front view of the RO unit*

Fig. 2: *Rear view of the RO unit*

Dosing system option:
Dosing system for anti-scalant (AS) / Sodium hydroxide (NaOH)

FT version: The **BWT PERMAQ® Pico** devices in the FT-version are equipped with the **water flowmeters** and a **control valve for concentrate flow**.

1.6 Scope of delivery BWT PERMAQ® Pico

BWT PERMAQ Pico (on/off):

1 x Reverse osmosis BWT PERMAQ® Pico

3 x Flexible pipes

1 x **Installation and operating manual**

1 x Filter cartridge 5µm depending on the model 10"/ or 20"

BWT PERMAQ® Pico on/off, HR on/off, on/off FT, HR on/ off FT

BWT PERMAQ Pico Duo:

2 x Reverse osmosis BWT PERMAQ® Pico Duo

6 x Flexible pipes

2 x **Installation and operating manual**

2 x Filter cartridge 5µm, depending on the model 10"/ or 20"

1 x Assembly connection tool set

BWT PERMAQ® Pico Duo

BWT dosing system - OPTION:

1 x Pre-assembled precision dosing pump mounted on PP-block with suction line and injection point

1 x Screw-fastened retaining plate

1 x Water flowmeter, connection 3/4", tank volume of plastic-container 3 litres.

BWT PERMAQ® Pico with optional Anti-scalant- / NaOH dosing system

Configuration options for all BWT PERMAQ Pico units:

The reverse osmosis device consists of a particle filter to protect the membrane, raw water high-pressure pump, reverse osmosis membrane in pressure pipes and a measuring and control unit to control and monitor the individual operating states.

Version using RO membranes with increased salt retention (HR):

Use of RO membranes with increased salt retention and reduced permeate performance.

Version with flowmeter and concentrate regulating valve (FT):

The FT version is equipped with two integrated water flowmeters for feed water and permeate as well as a needle valve for manual concentrate control. The FT version is available both with low-pressure membranes and HR membranes with increased salt retention (HR).

Optional external dosing unit for antiscalant (AS) / sodium hydroxide (NaOH):

For the revese osmosis BWT PERMAQ® Pico is an optionally dosing unit (AS) available. Reasonable advantages could be reached with an increased CO_2-concentration in the feed water. Further unneeded substances could be reduced with the used of sodium hydroxide (NaOH). Measurments have shown that these substances transformed into bicarbonate and therefore could be retained by the RO membrane.

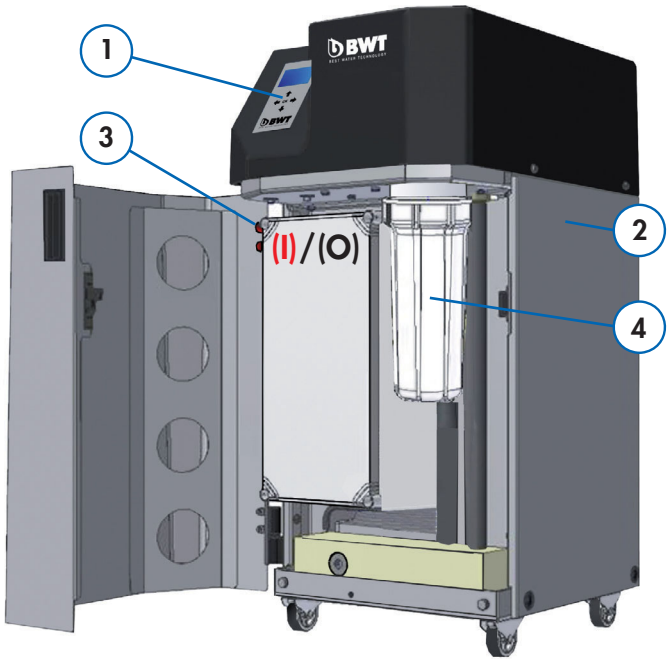


Fig. 3: *Front side of the RO unit*

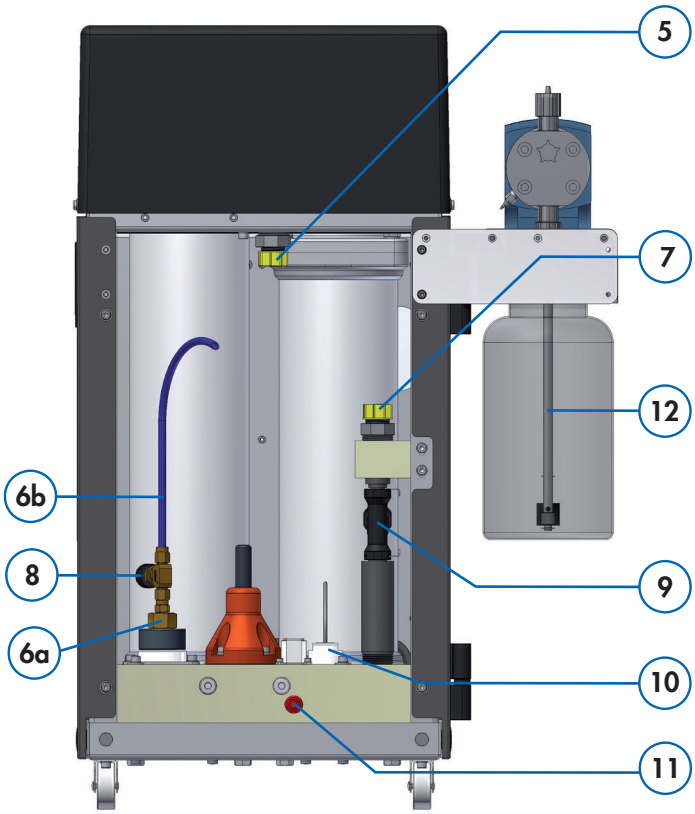


Fig. 4: *Rear side of the RO unit*

1.7 Overview of the unit components

1 Display + operating panel
2 Position of the EC rating plate
3 Main voltage switch **"ON/OFF"**
4 Pre-filter/membrane (feed water)
5 Feed water entry 3/4" (only PERMAQ® Pico 70 = 1")
6a Concentrate outlet 13mm
6b Concentrate outlet (FT version) 8mm
7 Permeate outlet 3/4" (only PERMAQ® Pico 70 = 1")
8 Concentrate regulating valve (FT version)
9 Liquid flowmeter for permeate (FT version)
10 Measurement of the electric conductivity
11 Permeate rejection (FT version)

Options:

12 Optional dosing system

Note: All operational procedures, as well as the important parameters can be seen on the display **(1)**. This allows fast control of all functions.

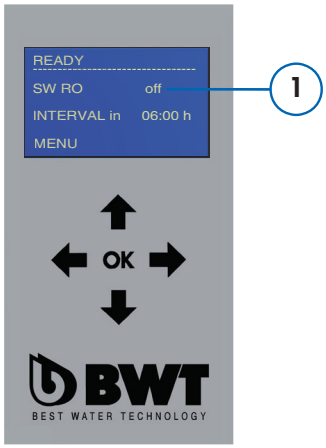


Fig. 5: *Display (controller of RO unit)*

1.8 Function description and intended use of device

Membranes separate the raw water flow, which is supplied under high pressure, into low-salt pure water **(permeate)** and the concentrated waste water with dissolved ions and salt **(concentrate)**. To achieve a higher water conversion factor **(WCF)** and **to raise up the service life of the membranes**, the **raw water** must be softened or **conditioned with an anti-scalant**.

The device can be operated in the **off**line and in the **on**line process, i.e. the produced permeate is either stored in a permeate tank and is delivered to the consumer via a booster pump, or it is delivered to the consumer via a pressure reservoir without booster pump.

Characteristics of reverse osmosis:

Characteristic quality values of a reverse osmosis are firstly permeate conductivity and secondly the so called water conversion factor (WCF).

The conductivity provides information about the rate of dissolved salts in the permeate. This value is determined by the salt retention rate of the employed membrane. Commercially available membranes have a salt retention rate of at least 95%. Permeate conductivities of between 5-30 µS/cm can be achieved with typical potable waters.

The water conversion factor (WCF) states how large the produced permeate quantity is in relation to the supplied quantity of untreated water. **The higher the water conversion factor is, the lower the waste water.** Typical water conversion factors of modern devices are between 40% and 80%.

Intended use of device:

The BWT PERMAQ® Pico device serves the desalination of water with potable water quality. The preliminary treatment of the raw water is to be checked by your local dealer, on principle.

Every deviation from the intended purpose, e.g. deionisation of feed water (of non-drinking water quality), can led to irreversible health or functional damages (e.g. undesired microbial contamination of the RO unit).

The device shall only be used for its intended purpose, in line with the installation and operation instructions and in the environment to which intended!

1.9 Preconditions for the installation

Preconditions for the installation:

Please observe all applicable installation- und accident prevention regulations, general guidelines, hygiene requirements, and technical specifications.

Installation site of the RO / requirements:

When installing the device, select a location where the device can easily be connected to the water supply network.

A connection to the sewage system and a separate mains socket **(voltage supply, see technical data)** must be nearby. Please connect the PE mains plug only to a grounded socket.

The **rated mains power (see technical data)** and the requisite **feed water pressure** must be present at all times.

Frost protection and ambient temperature:

The installation site must be free of frost and kept free of chemicals, paint, solvents and fumes.

Feed water requirements (softened water):

The reverse osmosis has to be installed upstream to an softener or dosing station.

When the reverse osmosis unit is operated without further pretreatment, then it could led to risks in dependence of the used feed water quality that includes hardness constituents (lime) on the membrane and that negatively impair the performance (volume fow) of the membrane as well as the quality of the permeate.

The RO unit must only be fed with **cold drinking water**, which meets the **legal requirements for potable water** and covers the specifcation in **table 1**.

Table 1: *Limit values of the feed water*

Details of the permissible feed water (soft water):	
Feed water temperature (min./max.)	**5°C / 30 °C**
Ambient temperature (min./max.)	**5°C / 40 °C**
Silica (SiO_2)	**≤ 20 mg/l**
Oxidants, chlorine	**≤ 0.05 mg/l**
Iron and manganese (Fe+Mn)	**≤ 0.1mg/l**
Salt level, "Total Dissolved Solids" (TDS)	**≤ 1000 mg/l**
Hardness range	**= 0 °fH/°dH**
Carbon dioxide (CO_2)	**< 20 mg/l**
Silt Density Index (SDI)	**≤ 3.0 %/min**
pH-value (soft water inlet)	**pH 5 ... pH 10**

Danger: Through improper feed water quality! The values given in the technical data thresholds, must not be exceeded (see chapter 6).

Pre-treatment:

In general a **particle filter** (separation efficiency ≤ **100µm**) should be installed upstream of any reverse osmosis unit. If the feed water is treated with oxidising disinfectants (chlorine, chlorine dioxide, etc.), an activated carbon filter has to be placed in front of the unit.

A further pre-treatment must be determined by the BWT service depending on the feed water quality.

Pipeline supply:

Observe: Corrosion-resistant material must be used for the piping in the permeate area (e.g. plastic or stainless steel).

- A shutoff valve is to be assembled on the inlet side of the RO unit, so that the raw water supply may be interrupted for service purposes.
- The on-site installation should performed with a feed water supply of **at least DN25 (Pico 10-60) /DN 32 (BWT Pico® 70)** to avoid unreliable operation. An undersized inlet causes the danger of an interruption of the operation due to insufficient water pressure or insufficient flow, e.g. when rinsing the RO membranes.

Observe:

For protection against the pollution of potable water installations due to backflow, a protection unit according to EN1717 has to be installed upstream of the RO unit.

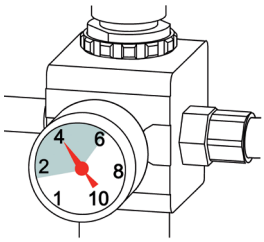
Setting the correct operating pressure:

The feed water pressure must be between **2.0 ... 6.0 bar** to guarantee an optimal functioning of the unit.

To maintain correct inlet pressure of **>6bar**, it should be installed a pressure reducing valve. Please do not operate the unit if the pressure is below **2.0bar**.

The installation of a pressure-reducing valve can decrease the flow rate negatively.

A minimum operating pressure is required for optimum functioning of the unit. Besides, the water pressure should not exceed the maximum permissible pressure.



Pressure variations of more than **± 0.5 bar are to be avoided!**

Prohibited mode of operation:

Observe: The following inadmissible operating modes are to be excluded:

- Feed water outside of the technical specifications (see **table 1**);
- Overdosing of approved disinfectants or non-compliant cleaning chemicals, e.g. chlorine;
- High fluctuations of the main feed water supply pressure;
- Operation without a grounded PE mains socket;
- Heavy fluctuations of the mains voltage;
- Excessive switching frequency of the unit due to incorrectly set (e.g. too closely positioned) ON/OFF-switching points in the permeate tank;
- RO operation with nonfunctional or covered cabinet fan;
- Operation of the unit without housing cover or an opened door of the control cabinet;
- WCF threshold value set too high;
- Operation near direct heat sources or open flames (e.g. radiators, exposure to sunlight).
- Modifications and alterations of the device are not permitted for reasons of safety. All parts and accessories used are specially designed for this unit.
- Operation without tip-over protection (only for Pico 40-70).

2.1 Assembly suggestion BWT PERMAQ® Pico for on- and offline operation

The permeate generated is often stored either in an atmospheric pure water tank and pumped to the consumer using a pressure amplifier pump (see **Figure 6**, offline operation), or it is transported directly under pressure to the consumer without an intermediate tank (see **Figure 7**, online operation). The figures below show possible process chains consisting of softening, BWT PERMAQ® Pico10-70 as well as the downstream pressure amplification components.

BWT PERMAQ® Pico in offline operation

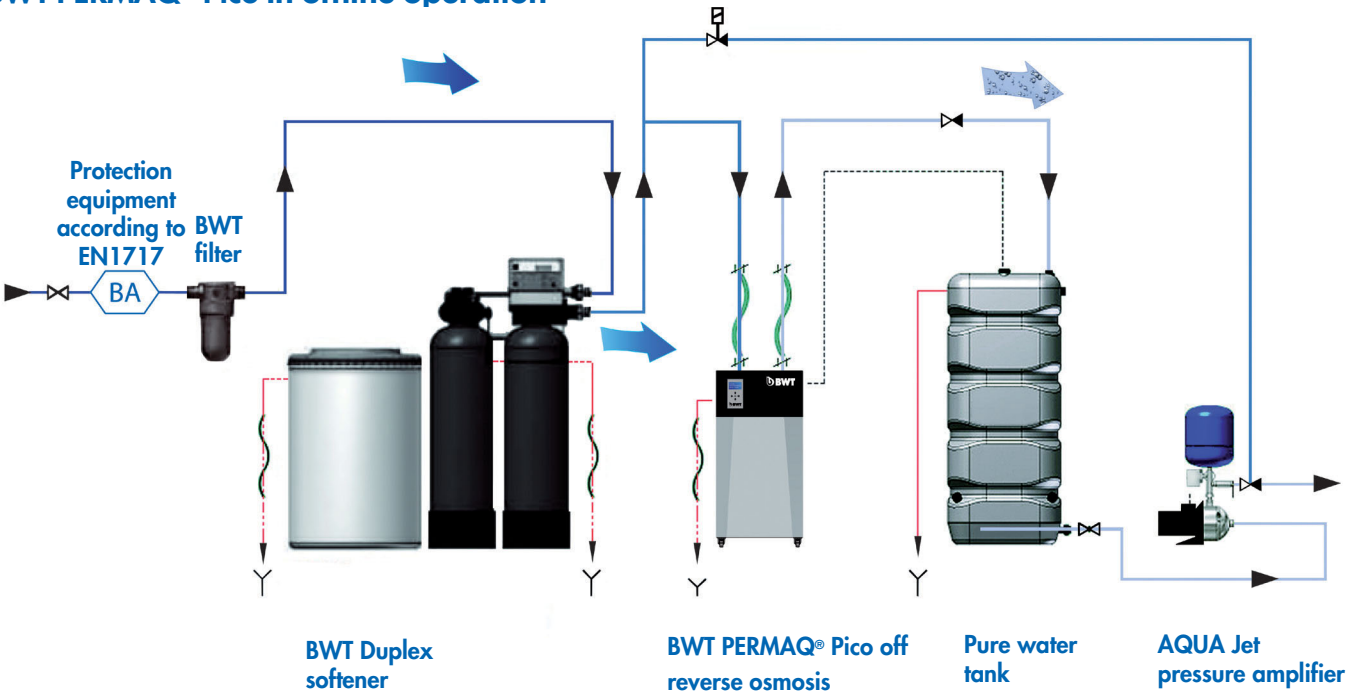


Fig. 6: *Installation recommendation: for offline operation*

There is no counter pressure at the permeate side in the offline method, which generally results in a higher permeate outflow compared to the online method.

BWT PERMAQ® Pico in online operation:

The online method is generally used for smaller installations, where the permeate quantity generated roughly corresponds to the average permeate utilisation. In this case, a perfused pressure reservoir is used instead of the pure water tank and pressure amplifier pump. This pressure reservoir is used to buffer brief peaks of demand. The counter pressure that builds up pumps the permeate directly to the consumer. We recommend the use of a **BWT multiblock S4** to avoid complex piping.

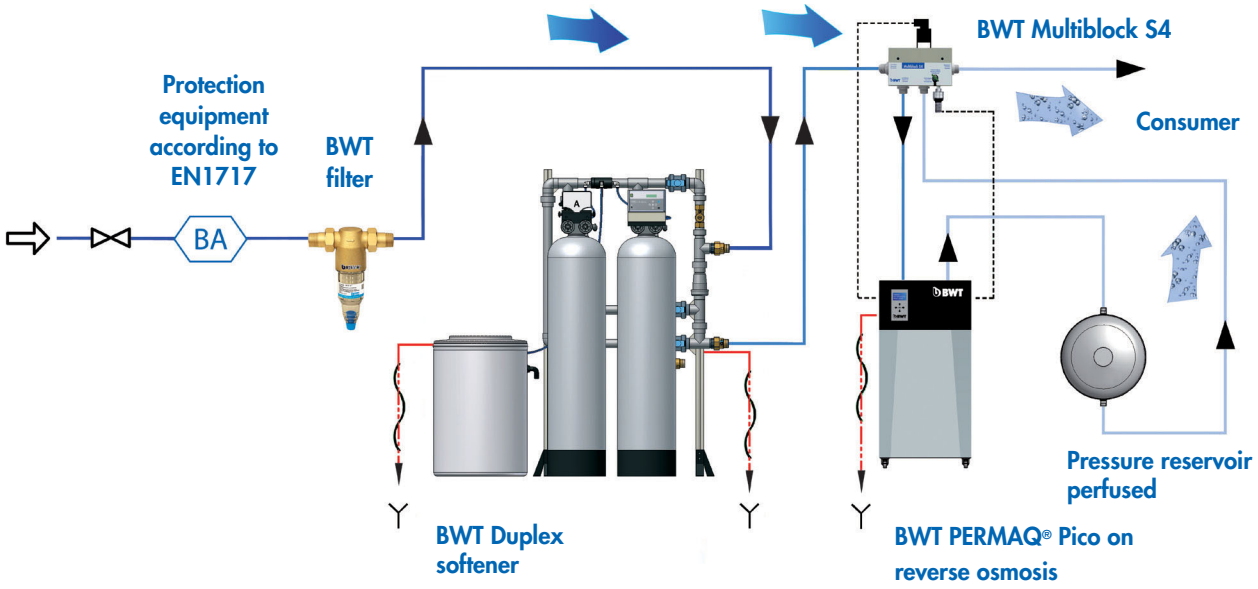


Fig. 7: *Installation recommendation: for online operation*

BWT PERMAQ® Pico in offline operation with BWT AQUA Flex

BWT AQUA Flex is a combination of an opaque, hygienic pure water tank and an frequency-controlled submersible pump. Many application requirements can be met with its 100 or 320l tank volume and a flow rate between 500 and 2450l/h.

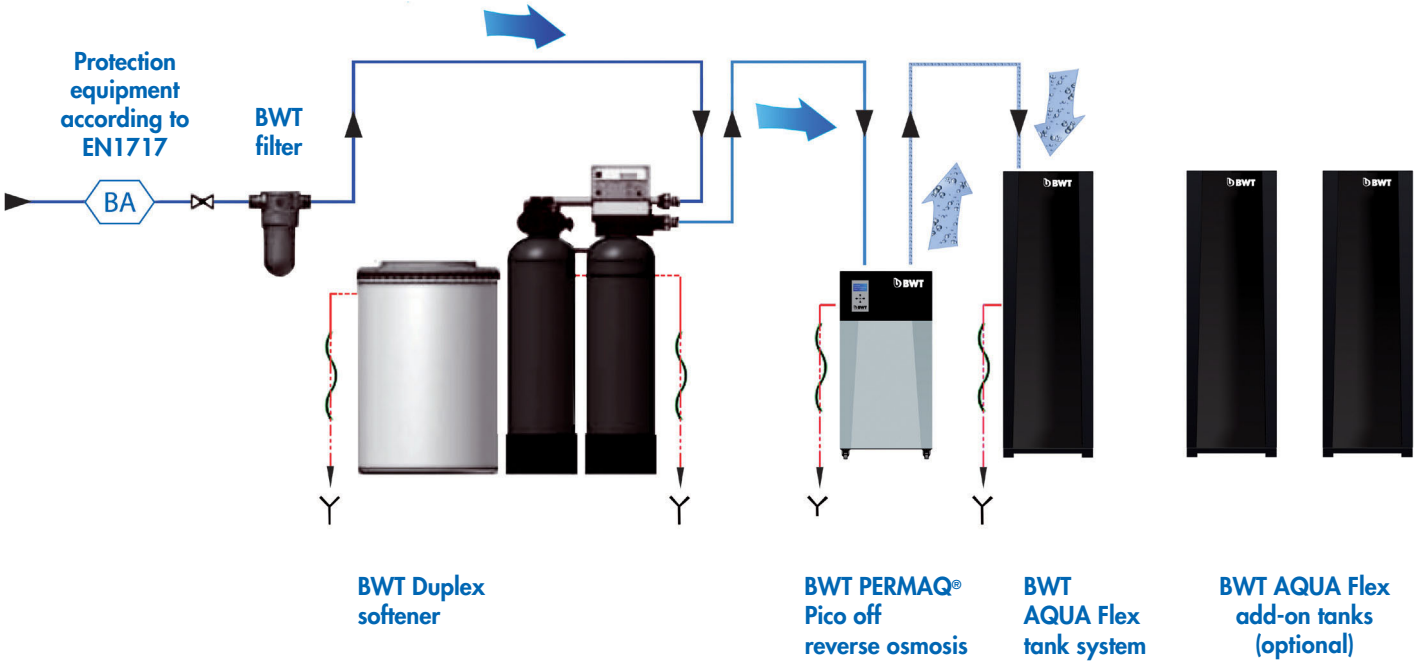


Fig. 8: *Installation recommendation: for offline operation with AQUA Flex*

2.2 Transport and installation

Unpacking of the device:

Attention: Remove the device from its packaging, **transport locks** and **hygienic closures**. After that check the delivery to see that everything is there and that no damage was caused during transport.

- At the installation side, the floor must be plane and able to hold the operating weight of the unit (see technical data).
- Secure unit against non-controlled movements while using and transporting it.

When installing the unit, select a location where the unit can easily be connected to the water supply network. A connection to the sewage system (at least DN 50), a floor drain and a separate power supply (see technical specifications) must be located in the immediate vicinity.

Anti-tip protection:

- The included retaining stay component must be mounted, for BWT PERMAQ® Pico models of the size 40 to 70.
- Move the units tip-over protection bottom to the ground and attach it at the place of installation.

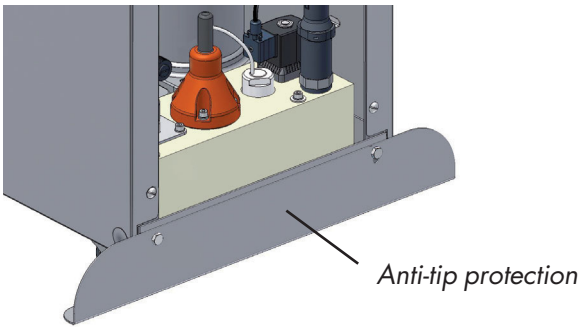


Fig. 9: *Rear view PERMAQ® Pico 40-70 with tip-over protection*

2.3 Hydraulic installation

Note: Please check regularly all pre-treatment and post-treatment water hoses of the firm and tight connections.

Observe: The connection to the water mains must comply with local plumbing regulations and policies for the construction of water installations, general hygiene and technical data must be observed.

Connecting to the water pipe:

Connect the unit using the supplied connection hoses, which are included in the scope of delivery according to the following figure.

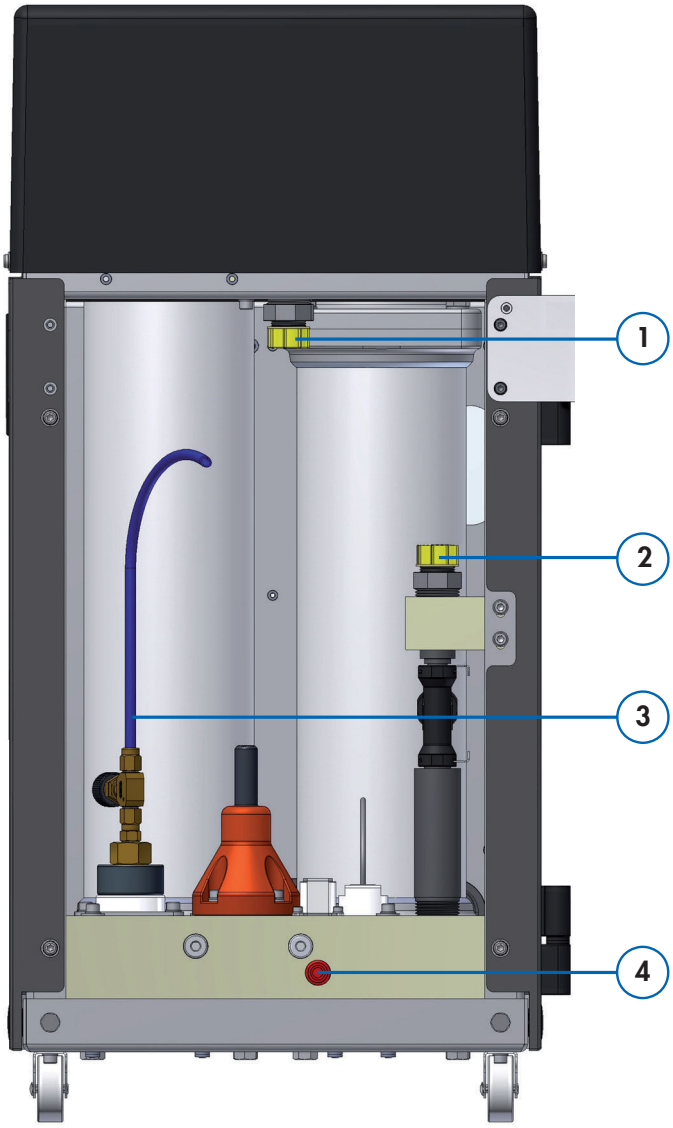


Fig. 10: *Hydraulic connection the example of the Pico FT version*

No.	Description:	Dimensions:
1	Soft water inlet	3/4" (Pico 70: 1")
2	Permeate outlet	3/4" (Pico 70: 1")
3	Concentrate outlet	8mm (FT version)
	(Standard hose connection)	*13mm*
4	Permeate rejection	10mm (FT version)

- The device **must installed in a flexible manner,** to maintain a save operation. We recommend the use of the hoses supplied.
- Secure loose waste water hoses so that they do not wave around (hose wagging).
- Please install the hoses so that the device may easy move forwards, to maintain a convenient maintenance and service.
- Ensure a minimum distance of ≥ 0.60m to the walls of the room, to maintain a working space for maintenance and service.
- Please adhere to all dimensions as well as bending radius in the assembly of the flexible tubes and connection sets.
- In case of first commissioning led the waste water to the drainage as well as rinse the water pipes sufficiently before reconnecting the device. (tank, washing machine etc.).
- Guide the flexible concentrate tube with an **"air break"** to the onsite existing drain pipe and fasten it, if possible.
- Check all water connections regularly to ensure that they are tight.
- The installation of an upstream stop valve (not included in the delivery) is recommended.
- The initial commissioning should only be done by qualified staff of the dealer.

Assembly instruction BWT PERMAQ Pico Duo:

PERMAQ® Pico online / PERMAQ® Pico offline

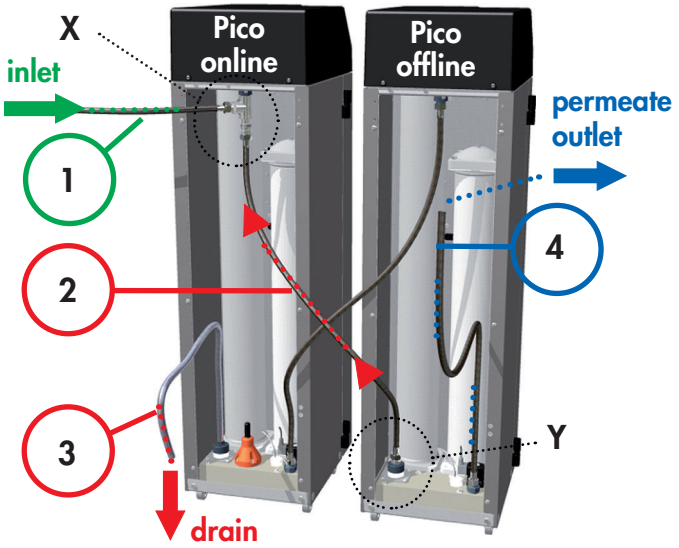


Fig. 11: *Assembly of BWT PERMAQ® Pico Duo*

BWT PERMAQ® Pico Duo is a combination of two units, which work in series. This achieves the highest salt retention rates and purest water qualities.

1. Feed water inlet

2. Concentrate recirculation (only for Pico Duo 40-70)

3. Concentrate drainage (waste water)

4. Permeate outlet

X: Detail 1 - T-piece 3/4" (or 1" in case of Pico Duo 70/60)

Y: Detail 2 - Reducing pipe, diameter 3/4" to 1/2"

Observe: For both devices, PERMAQ® Pico Duo 20-10 and 30-20, the second stage concentrate is not recycled but discarded together with the concentrate of the first stage.

Detail 1 = T-piece with check valve

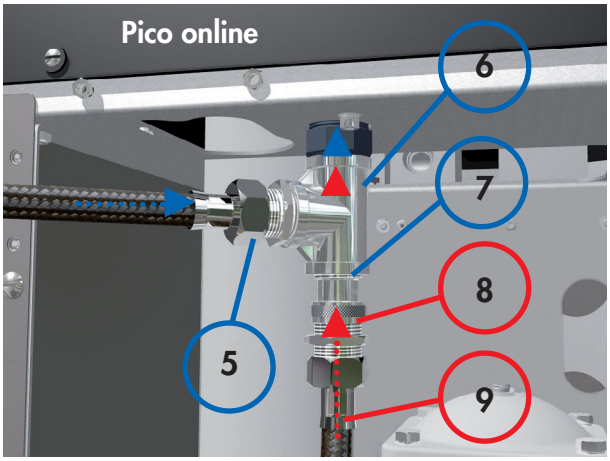


Fig. 12: *Assembly of BWT PERMAQ® Pico Duo*

5. Pipe thread 3/4" (or 1" in case of Pico Duo 70/60)

6. T-piece (or 1" in case of Pico Duo 70/60)

7. Check valve 3/4"

8. Pipe thread 3/4" (or 1" for Pico Duo 70/60)

9. Flexible hose 3/4"

Detail 2 = Reducing pipe

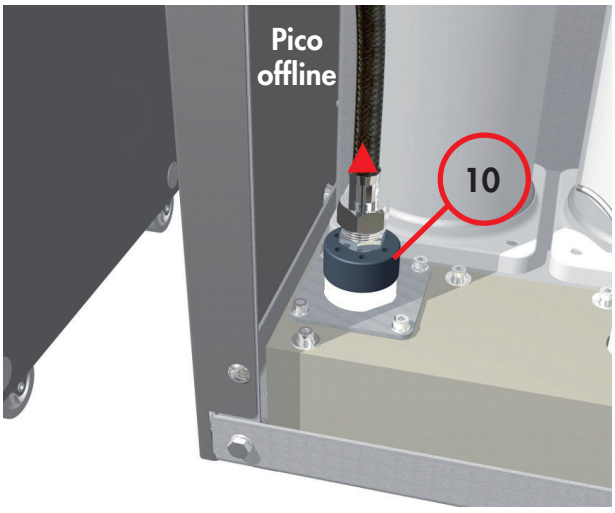


Fig. 13: *Assembly of BWT PERMAQ® Pico Duo*

10 Reducing pipe, diameter 3/4" to 1/2"

2.4 Electrical installation

The electrical connection of the device as well as of the external contacts (e.g. start/stop signal, external valves, residual hardness monitoring system, external dosing, etc.) are usually realised by your BWT Service technician on site in the course of first commissioning.

- **Make sure that there is a sheltered socket in the installation area (see technical data). The length of the units mains cable is 1.0 meters.**
- The opening for the multi cable connections is located on the lower rear side of the control box.
- All the relay outputs must be operated with their technical suitable voltages (either touchable low voltage or mains voltages, but observe that you never mix these unequal types).
- Please never cover the **air gaps** of the cabinet fan placed at the control box.

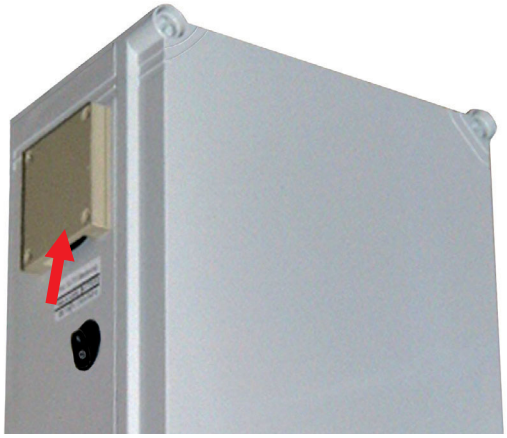


Fig. 14: *Air inlet opening (outside of the control box)*

Starting the unit by an external signal:

The installation of external signals for activation and deactivation requires external contacts. For controllable switching, both digital switches and analogue signals (4-20mA) are possible. Usually, these level sensors are installed in a permeate tank downstream of the RO unit.

The following options are available for digital contacts:

- 2 foat switches, either both NO; or both NC
- 1 single contact NO or NC

Analogue signals:

- Ultrasonic sensors (4-20mA)
- Pressure sensors (4-20mA)
- Further signals (4-20mA)

Attention: Also in case of varying permeate consumption, the switching frequency of the unit is to be reduced to a minimum. The two switching points of the permeate storage tank must be configured at an interval which ensures that the RO unit **operates for at least 30 to 45 minutes** depending on the activation or request.

Note: The consistently insufficient operating times (e.g. excessive start/stop circuits) have a negative effect on the useful life of the membrane modules.

Electrical safety instructions:

Danger: caused by electric current or voltage!
The device has the safety protection class 1 and must not exceed the specifications of the **voltage supply 230Volt and 50Hz**. Please use the always effective earthed socket, to insert the mains plug in the existing grounded outlet. Please note before any servicework start to unplug the CEE plug (mains plug).

Dangerous electric currents and voltages at the unit can injure people. Only a **qualifed electrician** may execute work on the electrical equipment according to electro technical rules.

Observe: Protect the unit against humidity (e.g. moist places of installation) and unauthorised mechanical or electrical interference.

Test according to accident prevention regulations:

In case of the combination or installation of machines, equipment of different manufacturers or suppliers, after the reconstruction of products supplied by us – also by our technicians – involving an interference with electric equipment, the operator shall perform a precise test in accordance with accident prevention regulations.

Therefore VBG 4 is applicable – corresponding to the respectively applicable electric engineering regulations prior to commissioning.

Electrical interferences:

The emission of interference (voltage peaks, high-frequency electromagnetic fields, interference voltages, voltage fluctuations…) by surrounding electrical systems may not exceed the maximum values specified in EN 61000-6-4.

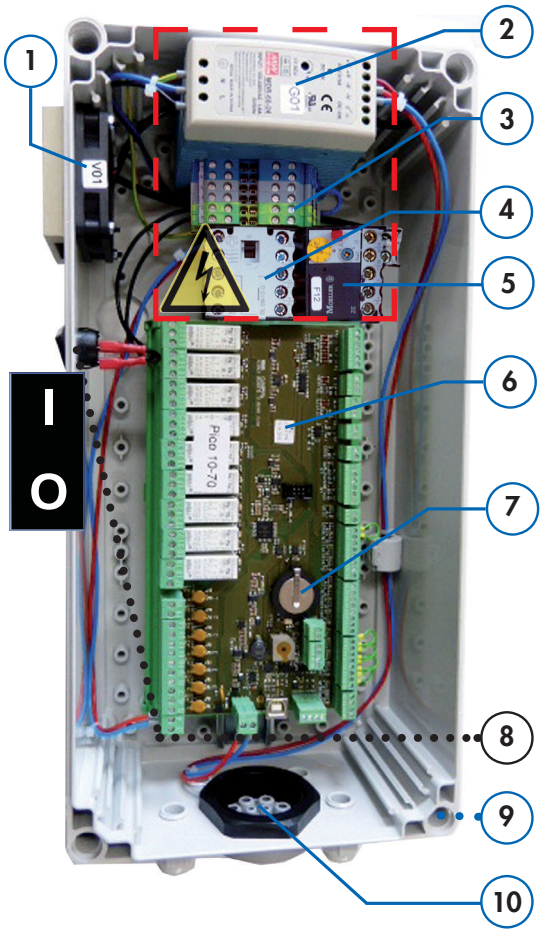


Fig. 15: *Opened control box*

Electrical connection (only by qualifed electricians):

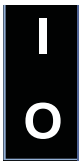
- Interrupt the voltage supply of the unit in case of maintenance and service work (unplug mains plug).
- Protect the mains supply by a 16A fuse.
- Max. rated load of alarm relays: 230V/8A
- Max. rated load of active valve relays: 24V(DC)/10VA
- **Observe:** Do not operate the ingoing external contacts (e.g. start and stop contacts) with external voltages (potential-free contacts).

Items of the control box:

1. Cabinet fan
2. Power supply 24 V(DC)
3. Terminal blocks
4. Motor contactor
5. Motor protection relay (thermocouple)
6. Pico unit mainboard 24V(DC)
7. Memory battery (type: CR 2032 - 3V)
8. Main- voltage switch (left- hand side of control box unit)
9. Countersunk head screws (x4)
10. Cable gland plate

3.1 General operating concept

The BWT PERMAQ® Pico device is equipped with a microprocessor control and a matrix display.
Operation and display of the individual functions and operating data is performed exclusively with the operating panel.



Main- voltage switch:

The main-voltage switch is arranged at the left hand side of the control box-unit. The device can be switched on using the main switch once the mains plug is connected.

(I) Switches the unit **"ON"**

(O) Switches the unit **"OFF"**

Fig. 16: *Main- voltage switch ON/OFF*

Basic design of the control system:

The device is operated and configured using the function keys on the control unit.
Several operating modes can be selected after switching on the device.

For example, the step times and parameters can be changed using the password-protected service menu. During commissioning, all the parameters are configured on-site for you by the BWT service team based on the respective situation. Please feel free to contact the BWT service team if complex changes are necessary.

"OK"/ ENTER: Confirmation of a selection or a function.

" ◄" (arrow to the left): Position change to the left, Press and hold the **"Left arrow"** key for 3s → Go to the SERVICE MENU during operation, interval and test mode and then return back.

" ► " (arrow to the right): Position change to the right, Press and hold the "Right arrow" key for 3s → Go to the **"OFF"** status from the operation, interval mode, test mode as a HARD STOP

" ▲ " (arrow up): Scrolls within the SERVICE MENU upwards

" ▼ " (arrow down): Scrolls within the SERVICE MENU downwards

Fig. 17: *Display control*

Main menu:

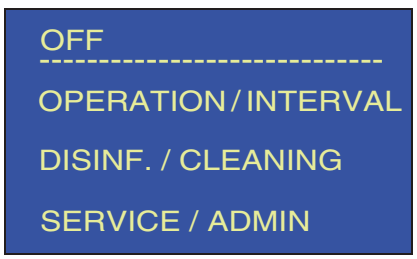


Fig. 18: *Menu display*

The menu screens consists of:

- **1st line = Operating condition** (is underlined)

("OFF", "OPERATION", "INTERVAL OPERATION", "Read SERVICE MENU" "Edit SERVICE MENU", "TEST MODE", "INSPECTION MODE", "DESINFECTION int.", "DESINFECTION ext.", "ALARMS/MESSAGES")

- **2nd-4th line = Submenus or operating informations**

3.2 Overview of operating modes

The accessible program routines consist mainly of several individual steps that runs sequentially. The step times are setable.

The unit consist of the operating modes as listed below:

- **OFF**
- Operation (automatic operation)
- Interval operation
- Test mode
- RO cleaning - disinfection internally
- RO cleaning - disinfection external
- Revision operation (only for BWT-Service) violet

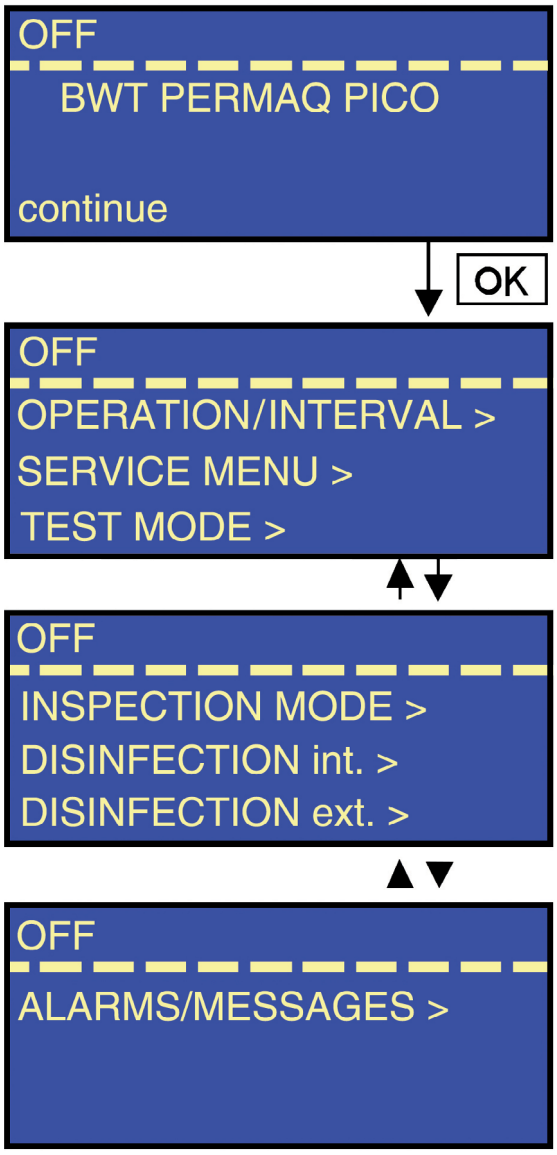


Fig. 19: *Selection of the main menu items*

Status "OFF":

The device is switched on and the control unit is in **"OFF"** status. The device cannot be switched on by an external signal (level). The device continues to be in **"OFF"** status immediately after the main switch is turned on and has to be then activated by appropriately selecting and confirming using the **"OK"** button.

OPERATION (Mode = "Ready"):

This is the default mode in which the device is operated. The device is ready for use and displays the **"Ready"** status. The RO changes to the operating mode (**"Production"**) as soon as an external signal is received from the storage tank.

Switching points of a pure water tank:

Figure 20 below shows the physical arrangement of possible switching points in the pure water tank. The device can be controlled using analogue signals (in bar +%) and digital signals (NO / NC) depending on the level. The level data in percentage should only be considered as a rough indication and can be adjusted to the locally existing conditions at any time.

Once a request signal is present, it is shown on the display. Thus the device changes (automatically) to the production mode after going through the specified start-up sequence of several start-up steps: (**"S1 RO start 1"**, **"S2 RO start 2"**, etc.).

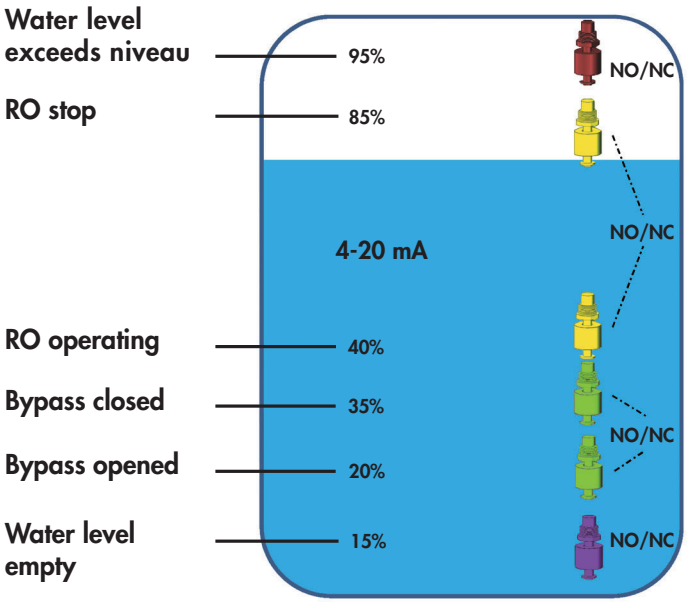
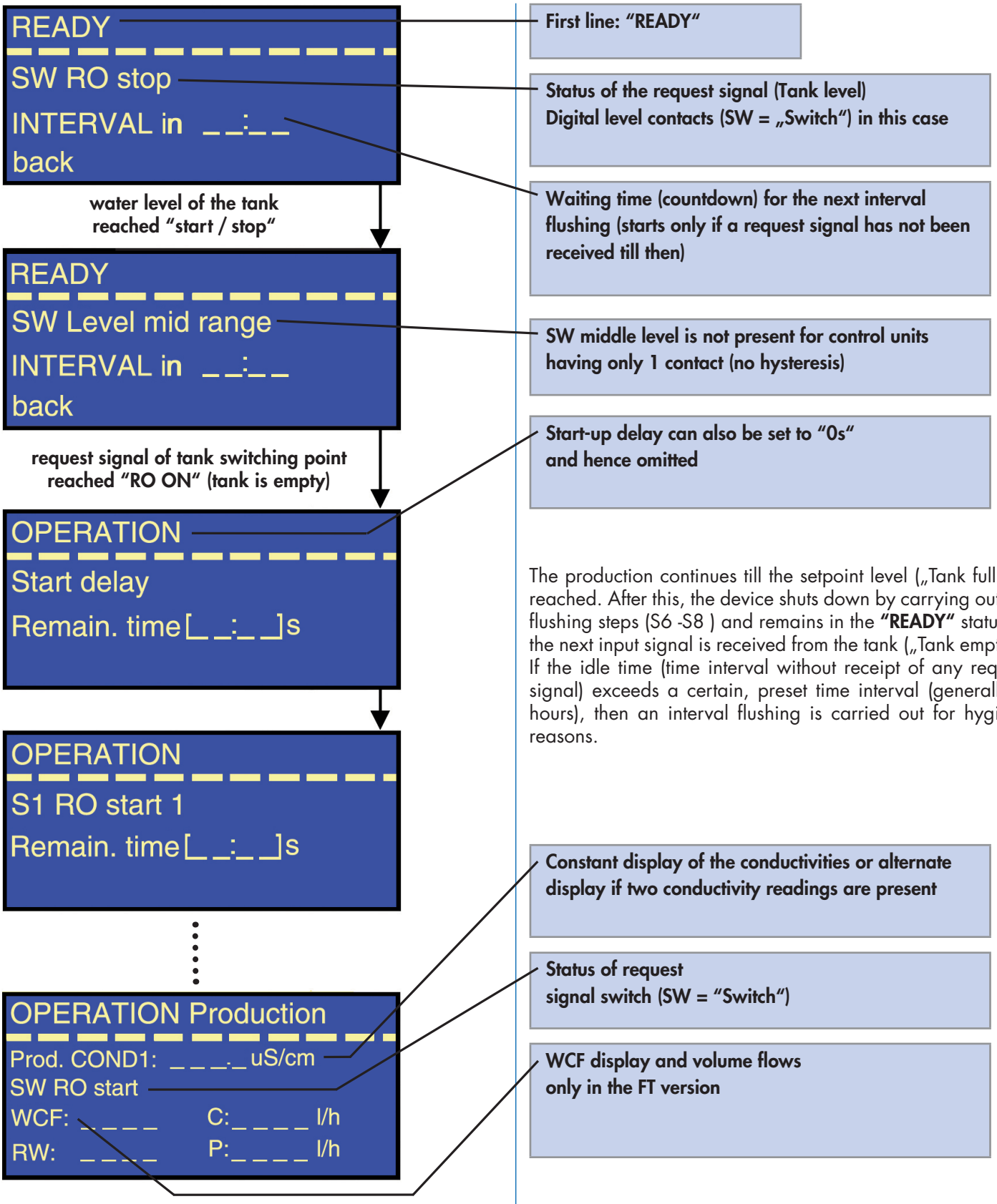


Fig. 20: *Possible switching points of the pure water tank*



The production continues till the setpoint level („Tank full") is reached. After this, the device shuts down by carrying out the flushing steps (S6 -S8) and remains in the **"READY"** status till the next input signal is received from the tank („Tank empty"). If the idle time (time interval without receipt of any request signal) exceeds a certain, preset time interval (generally 6 hours), then an interval flushing is carried out for hygiene reasons.

Fig. 21: *Start-up sequence of the automatic mode, until step of production*

Interval operation / interval fushing:

The device comes with a so-called interval flushing function. If there is no external request signal for a specified time, this interval flushing function automatically switches on after a preset time interval. This routine that is periodically repeated helps in minimising the microbacterial contamination risk when the device is idle.

If a request signal is not present, then the preset countdown timer for the waiting time(generally 6 hours) starts counting down. The device then changes to the first program step of the **"INTERVAL OPERATION"** mode. From the perspective of the step sequence, the steps of the interval operation correspond to those of the normal mode except that the actual production is skipped in the sequence.

The steps S4 and S6 are only displayed if external flushing valves are present during installation.

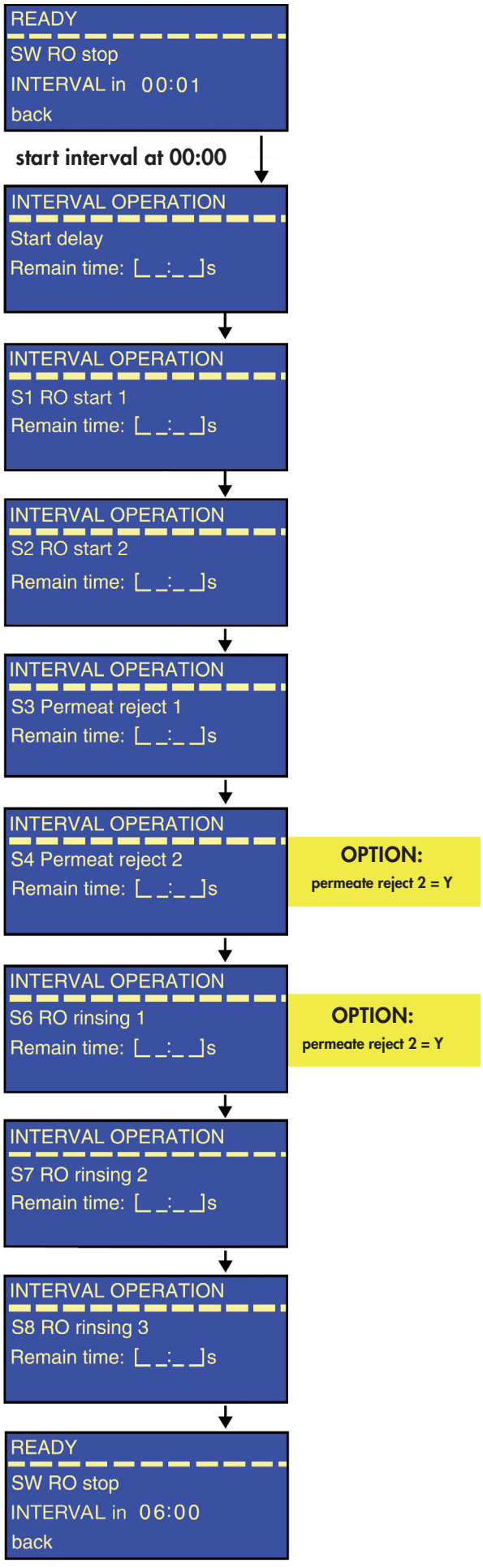


Fig. 22: *Step sequence interval operation*

TEST MODE (for BWT-SERVICE):

This operating mode is only meant for service staff and is used for quick troubleshooting in case of problems. In the **"TEST MODE"**, the program steps can be manually changed to the next step using the **"OK"** button regardless of the step times that are configured.

Observe: The level request signal is ineffective in the **"TEST MODE"**. Hence it is important to ensure that the pure water tank does not overflow during maintenance work.

Disinfection / RO cleaning internally (customer or SERVICE):

Various deposits are formed over time on the concentrate side of the RO due to sedimentation (scaling), which gradually reduce the permeate output. This undesirable process of deposition can be prevented to some extent by using the chemical **"AQUARIS RM"**. The same program function **"DESINFECTION int."** is used both for cleaning and for disinfecting the "RO".

The difference between RO cleaning and disinfection is only in the choice of the chemicals used for cleaning (**"AQUARIS RM"** for cleaning and **"AQUARIS DES"** for disinfection).

The complete disinfection and RO cleaning procedure is described in **"Part 5.2 and Part 5.3"**.

Disinfection / RO cleaning externally (for BWT-SERVICE):

This function is used if an external cleaning or disinfection device needs to be used. Such devices are provided with a circulation pump along with a storage tank. Pure water (permeate) and the cleaning / disinfection chemical is filled into this tank. This mixture is then cyclically pumped by the device over a long period.

Fig. 23: *External anti-scaling device for carrying out quick external cleaning*

The raw water and permeate valves are opened together for a long time if the external disinfection / cleaning mode is active. The cleaning solution can be circulated under slight pressure (long exposure time) through the RO in this manner.

INSPECTION MODE (for BWT-SERVICE):

The **"INSPECTION MODE"** enables each actuator (valve / pump) to be activated or deactivated. All the actuators are documented in the associated R + I diagram.

Observe: Alarms do not shut down the device in this mode. Access to both the **"TEST MODE"** and the **"INSPECTION MODE"** are reserved only for trained personnel of the BWT service team, since improper use of these functions can result in irreversible damage to the device.

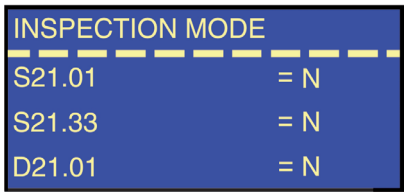


Fig. 24: *Switching the actuators on and off manually for testing purposes (Only for BWT service personnel).*

Like all the other sub-menus, you can exit the inspection mode using the **"back"** option at the bottom of the menu screen.

3.3 Alarms and service informations

Alarms / messages:

If a parameter that is relevant for the system exceeds the upper or lower limit configured in the **"SERVICE MENU"**, then an alarm message / alarm text is displayed and stored. An alarm priority and a time stamp is assigned to each alarm. The service technician can come to conclusions based on the alarms that are displayed for the purpose of rectifying the faults. The last 20 alarms (ring memory) can be stored and viewed.

Observe: Section 4.1 and the following sections provide an overview of the alarms and additional information on rectifying the faults.

Following **Fig. 25** below shows how to read the alarm information.

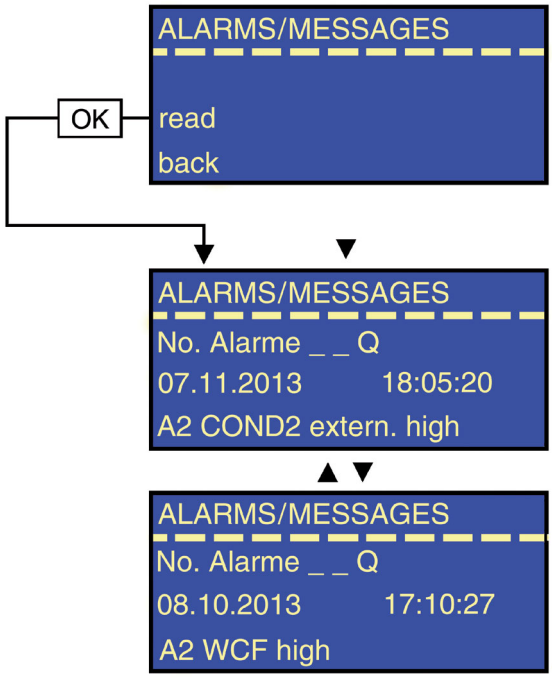


Fig. 25: *Procedure for viewing the recent alarms: Using the "arrow key ↓" you can scroll through the chronological arranged history of alarms.*

3.4 Service menu

The service menu is basically split into two. It can be read (**"Read SERVICE MENU"**) as well as edited (**"Edit SERVICE MENU"**).

Functions are basically activated using **"Y"** (**"YES"**) or deactivated using „N" („NO"). After logging in, all the settings are configured directly on the display using the **"OK"** button and the **"Arrow keys"**.

The service menu contains a language selection for setting the menu language (DE, GB, FR, NL).

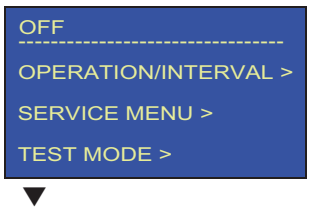
SYSTEM SETTINGS:

General parameters such as device number, order number and system time can be configured using this menu option. The polarity (NO, NC) of the external digital inputs for **hard-** and **soft stop** can also be changed here. The **"Permeate reject 2"** option enables you to control external flushing valves (reducing the risk of micro-bacterial contamination). The "Anybus Communicator" option is provided for Profibus or Ethernet / IP in case digital and analogue operating parameters need to be transferred to an external control unit. This function can be activated using a **"Y"** in the service menu.

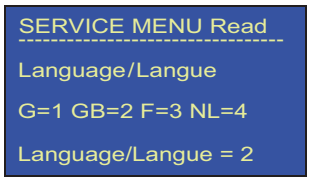
The display monitoring function (shutting down the system if the display connection is lost) can also be activated here using (**"Y"**) or deactivated using (**"N"**).

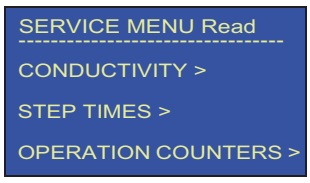
The default values (factory settings) can be loaded back if required using this menu option.

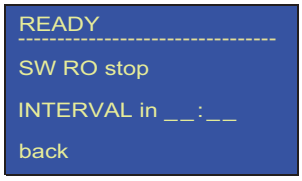
Main menu:



Servicemenu reading:







OK

OK

several times

OK

several times

OK

OK

OK

restart of the device

Reading of parameter settings:

The available parameter settings might be displayed as following.
Now select **"SERVICE MENU"** by pressing the **"OK"** button.

Reading of parameter settings in the "SERVICEMENU read":

By pressing the **"OK"** button the next menu screen appears.

By pressing the **"Arrow down"** button **several times** the next menu screen appears.

Please select the desired submenu by pressing the **"OK"** button and then press the **"Arrow down"** button **several times** to select each single paramater.

Exiting of "SERVICEMENU read":

Whenever the selectable field **"back"** appears, you are able to reopen the preceding menu by pressing the **"OK"** button.

By pressing the **"OK"** button in these final menu screen **"Read service menu"** it will be exit.

By pressing the **"OK"** button the RO unit would be restarted again.

Fig. 26: *Parameter settings*

WATER LEVEL:

The controlling of the device is defined in this submenu. This is generally defined by the type of level measurement in the pure water tank *(digital, analogue [4- 20mA bar], analogue [4- 20mA %]*). **Figure 21** shows a sample arrangement of possible switching points in the pure water tank.

The switching points can be activated or deactivated and their respective polarity or level position can be configured in this submenu of the service menu. A limit value for the maximum permissible bypass opening time can also be set.

FLOW MEASUREMENT:

The BWT PERMAQ® PICO 10-70 FT series is provided with flow meters. These can be activated or deactivated as needed in this section of the service menu. The nominal diameter of the flow meter can be also be adjusted and the flow can be compared with a reference measurement. A WCF alarm limit can also be set for the **"FT versions"** to ensure that the permissible efficiency (yield) is not exceeded.

A dosing pump can be controlled in the FT version of the RO if required. The signals of the raw water pump are converted into pulses by the control unit. Pulses can be set for (0.25 / 0.5 / 1.0 litre).

INCREMENTAL STEPS:

The step times of the individual program steps for all the operating modes having a program routine **(OPERATION, INTERVAL OPERATION, DISINFECTION internal, DISINFECTION external)**, can be changed here.

SERVICE COUNTER:

The operating hours for the run-time of the pump and the opening time of the bypass valve are shown as a sum in this menu option. The number of Starts- / Stops can also be read here and reset if required (e.g., pump replacement).

MEASURING THE CONDUCTIVITY:

All the settings related to the conductivity are configured in this menu option.

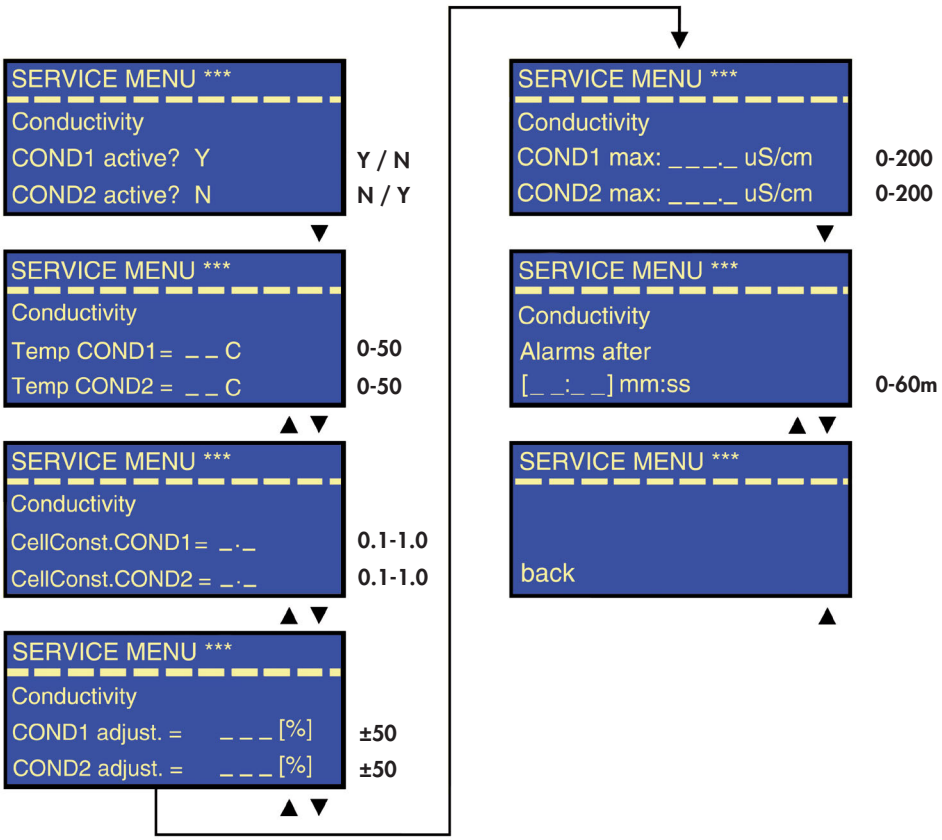


Fig. 27: *Possible settings for monitoring the conductivity.*
The permissible setting ranges are shown on the right side of the screen.

SERVICE INTERVALS:

The countdown timer for replacing the filter (should be carried out latest once in 90 days) and also the countdown timer for the annual maintenance interval can be set in this menu option. The telephone number of the responsible service centre can be entered at the same time.

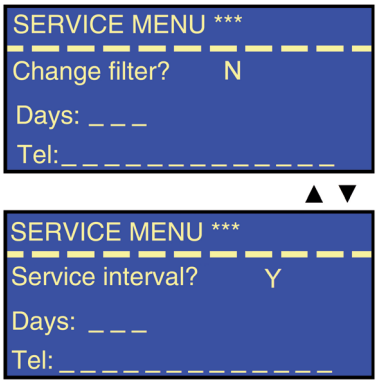
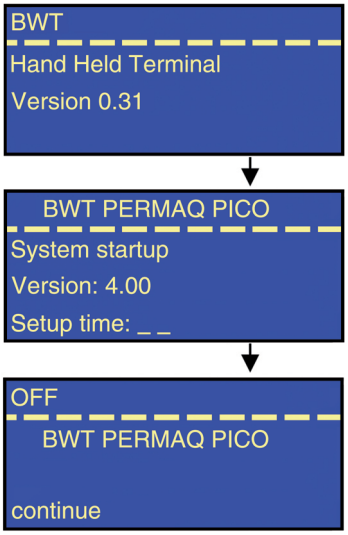


Fig. 28: *Settings of the service intervals*

3.5 Start of the unit

Program: Startup sequence:



- Turn the **power switch** (I) ON.
- The display shows the following screens.
- Press the **"OK"** button to open the main menu.

Start of automatic mode:

- Select **"OPERATION/INTERVAL"** by using the **"OK"** button.
- Changes to Ready mode if there is no request signal (level).
- Changes to the **first start-up step** if there is a request signal (level). The current program step and the remaining time are displayed in each step (except production).
- Tank level is between **"start / stop"**.
- The permeate is produced in the pure water tank in the program step **"OPERATION Production"** (permeate valve is open).

Fig. 29: *Program sequence OPERATION*

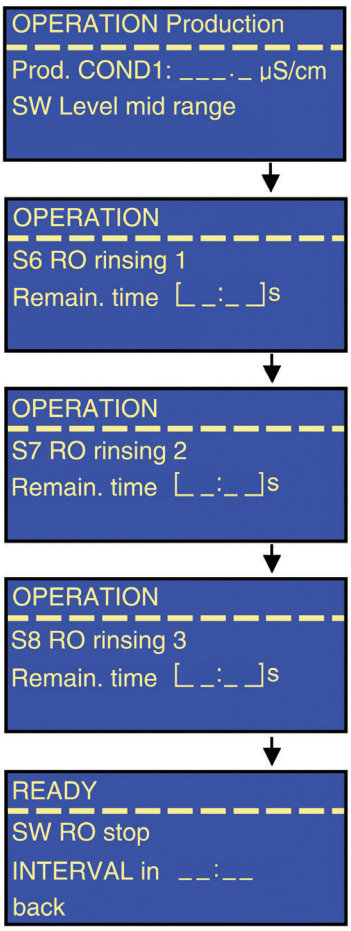


Fig. 30: *Automatic shutdown*

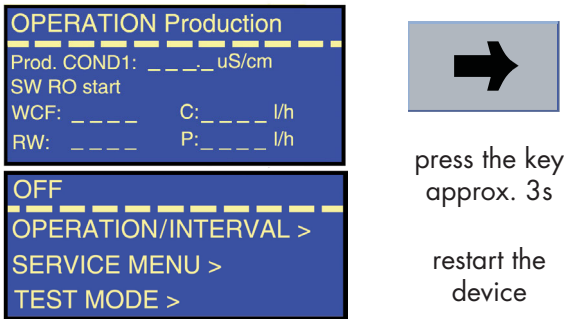


Fig. 31: *Manual shutdown of the device*

Automatic shut down after production:

- Tank level is between **"Start / Stop"**.
- The device automatically changes back to the **"READY"** status via the flushing steps (S6 -S8).
- Tank is filled with permeate
- Countdown until the next interval flushing

EMERGENCY STOP:

- Press and hold the **"Left arrow key"** **"►"** for **3s**, which causes the permeate production to stop immediately using a hard stop. The device immediately changes to the **"OFF"** status.
- **Observe:** The device remains in the **"OFF"** status and has to be restarted using the **"OK"** button when required using the select menu function **"OPERATION/INTERVAL"** command.

3.6 Operation with anti-scalant dosing (without softener)

Fig. 32: *Dosing system*

When operating of the BWT PERMAQ® Pico with hard water and in order to obtain an optimum yield (WCF), it is recomended to use the o**ptional anti-scalant dosing system**. The introduced **quantity of anti-scalant** is proportional to the raw water flow rate.

The dosing system can be mounted on the **left** or **right side** of the **RO unit** while observing the existing distances to the walls of the place of installation.

Up to a possible raw water hardness of 25°dH / 45°fH, the dosage of the specially developed anti-scalant **"BWT AQUARIS AF 05"** must be adjusted at the micro-dosing pump according the settings listed in the table below.

The **micro-dosing pump** is controlled via the water meter connected to the raw water inlet. This way, the dosage always adjusts to the respective raw water flow rate.

Further assembly informations and the initial settings of the anti-scalant dosing contains a separate OPM with the document number 145315.

Please perform all the settings according to the following table.

Settings for antiscalant dosing pump

Settings for dosing pump Microgala			
BWT PERMAQ® Pico on/off & Pico HR	**Stroke; min. %**	**Gear (Contact Mode)**	
		Pico on/off:	**Pico HR:**
10	40	4.00	n.a.
20	40	3.50	n.a.
30	40	2.50	n.a.
40	40	2.00	2.20
50	40	1.00	1.10
60	45	1.00	1.00
70	45	1.00	1.00

Note: The **recommended dosing volume of antiscalant (AF05)** is always **20 ml/m³**, regardless the range of hardness (max. 25 °dH / 45 °f) and applies to all Pico models.

3.7 Control valve for concentrate flow (FT version)

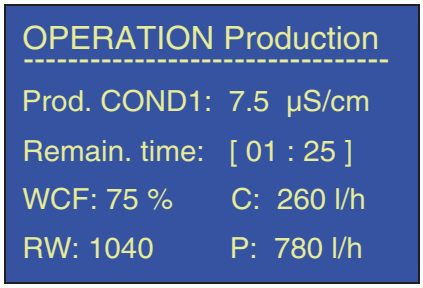
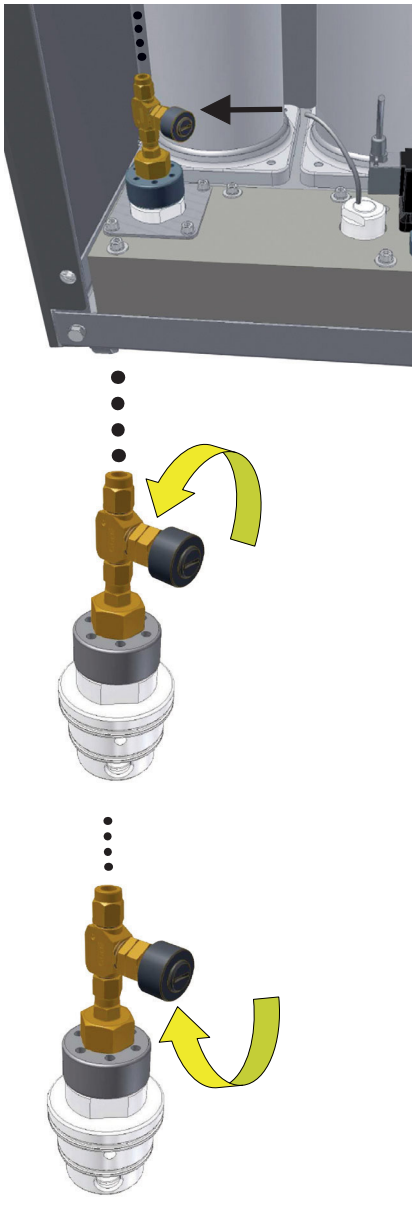


Fig. 33: *Setting of concentrate flow*

Note: Only applies to devices (FT version) with integrated flow meters for the feed water and permeate. The currently measured volume flows and the WCF value displayed in the step **"production"** (see **Fig. 33**).

Pleace observe: The **concentrate flow rate** has to be adjusted according the efficiency of the **permeate yield** (WCF) and as defined in the technical specifications.

Observe: The deviation with a permanently too low setting for concentrate rejection (too high WCF threshold value) may lead to a loss of performance, quality deterioration and even a break-down of the RO. These settings should be set for your safety only by qualified staff.



The **concentrate flow control valve** is on the rear of the device (bottom left).

Turning the control valve wheel to the left increases the quantity of concentrate thus decreasing the yield. Turning the wheel to the right decreases the quantity of concentrate. The current flows are available directly on the display in the **"Production"** step.

Rotation direction to the left: at the control valve **increases** the quantity of concentrate.

Rotation direction to the right: at the control valve **decreases** the quantity of concentrate.

Observe: The adjustable valve mustn't have completely be closed off.

In order to monitor an defined alarm limit, it is recommended to set up an appropriate upper threshold value for WCF into the settings.

Fig. 34: *Concentrate flow control valve*

4.1 Alarm summary

General procedure of fault elimination:

In the event of a **fault**, resetting or repair work may only be carried out **by an expert service technician**.

In case of a system failure please check:

- Firstly the electric power supply and afterwards the water supply

Alarm event:

With an occurring alarm event the user will see the corresponding **alarm text** and can hear the **audible warn** tone.
The RO remains in alarm mode until the alarm is acknowledged.

Acknowledging the fault:

Read the displayed alarm/message:

Acknowledging of acoustical signals: Press the **"OK"** button **once**

Acknowledging of fault messages: Pressing the **"OK"** button several times

In case of an finally resolved alarm cause, the operator should restart the RO via the selected **"Operation/Interval"** mode.

There are 3 categories of alarm events:

A1 Alarms - HARDSTOP Immediate deactivation of the unit to the **"OFF"** status. An alarm text is shown and an acoustic alarm signal is issued. Manual restarting of the unit is required.

A2 Alarms - SOFTSTOP Deactivation of the unit in which the unit runs via *program steps* to the **"OFF"** status in a controlled manner. An alarm text is shown and an acoustic alarm signal is issued. Since the RO unit is deactivated, subsequent manual restarting is required.

A3 Alarms - Messages The unit remains in the current program step and continues its normal operation. The A3 alarm events have to be interpreted as **"preceding alerts"** or **"warnings"**.

Observe: The alarm memory stores only the last incoming 20 alarms/messages (circular memory buffer).

Table 2: *List of possible alarms for BWT PERMAQ® PICO:*

"A1 alarm" (immediate shutdown of RO unit → OFF)	"A2 alarm" (orderly shutdown of RO unit → OFF)	"A3 alarm (= warning)" (RO unit → remains in production)
A1 Voltage 24V low	**A2** External soft stop	**A3** Ext. tank empty
A1 Battery low	**A2** Error bypass	**A3** Refill Antiscalant
A1 Inlet press. low	**A2** COND1 perm. high	**A3** Refill NaOH
A1 Pump error	**A2** External tank full	**A3** Change filter
A1 External hard stop	**A2** COND2 extern. high	**A3** Service interval
A1/A3 Inlet pressure low	**A2** Antiscalant empty	**A3** Error COND1
	A2 NaOH empty	**A3** Error COND2
	A2 Terminal error	
	A2 WCF high	

4.2 Troubleshooting - A1 alarms

Table 3.1: *Troubleshooting of A1 alarms*

Alarm text of the display:	Possible reasons:	Correction of the error:
"A1 Voltage 24V low"	• Supply voltage of the main board **less then 22V (DC)** • High fluctuations regarding supply voltage	• Check the input voltage of the power supply at the main board • Call BWT SERVICE team
"A1 Battery low"	• Battery supply voltage low (RO unit can´t display the current system time)	• Change of the battery and after acknowledging the alarm in „SERVICEMENU read" / „System Settings". If the system time is running, then it is an indication of an correctly system set.
"A1 Inlet press. low"	• Raw water inlet pressure is too low or an blocked pipe of the water supply (e.g. stop valve might be closed) • Water leakage in the system • Pre-filter blocked, maintenance interval exceeded • Rapid pressure changes in the system • Pressure switch P21.01 might not be connected properly • Pressure switch P21.01 defective • Raw water solenoid valve defective	• Check the inlet pressure of the water supply, it should indicate a corresponding free flow • Water leakage must be sealed immediately • Replace the prefilter • Repair work if pressure fluctuations • Qualified staff have to perform an check of the functioning connection of terminal P21.01 • Change of pressure switch • Change of defect parts (BWT service)
"A1 Pump error" *Protective motor switch of the high-pressure pump has been activated*	• RO pump D21.01 is defective, blocked and/or uptakes too much current -> motor protection relay F01 opens contact • The protective motor switch is not set to "auto reset" or is defective, or incorrectly wired	• Replacement of the defective pump • Check the motor protection relays setting is on "auto reset" (by qualified personnel) • Check of the wiring
"A1 External hard stop" (e.g. by regeneration lock, or residual hardness measurement) *If the single-column water softener is ready again, the message "A1 External Hard Stop" appears and the RO unit will automatically return into the step "Ready" (alarm auto resetting).*	• External water softener supplies hard water or is defective • Selected polarity of the switch in the menu (no/nc) do not correspond to the polarity of the incoming signal • Fault of the residual hardness analyser (e.g. indicator solution for the residual hardness analyzer is empty) • Residual hardness sensor defective	• Fill the brine cabinet of the water softener with salt • Correctly setting of polarity • Repair the pre installed water softener and then restart the RO again • Refill residual hardness anlyser • Call BWT SERVICE team

4.3 Troubleshooting - A2 alarms

Table 3.2: *Troubleshooting of A2 alarms*

Alarm text of the display:	Possible reasons:	Correction of the error:
"A2 External soft stop"	• Soft stop was triggered by external device (e.g. residual hardness measurement), therefore is an start-up not possible • Wrong polarity (no/nc) of the contacts do not correspond to the polarity settings in the "SERVICE MENU"	• Repair the failure of the external device and then restart the unit • Please set the correct polarity • Call BWT SERVICE team
"A2 Antiscalant empty"	• When an antiscalant dosing has been installed, the dosing tank may be empty • If antiscalant dosing is not present, the link at the corresponding terminal may be loose • Contact of dosing container is defective	• Prepare a new antiscalant solution and refill the dosing tank • Ensure that the contacts at the corresponding terminal are connected properly. • Call BWT SERVICE team
"A2 NaOH empty"	• The dosing tank is probably empty in case of NaOH dosing • If NaOH dosing is not present, the link at the corresponding terminal may be loose. • Contact of dosing container is defective	• Prepare a new solution and refill the dosing tank • Ensure that the contacts at the corresponding terminal are connected properly and tightly (by qualified personnel). • Call BWT SERVICE team
"A2 External tank full" (deactivatable / activatable in the SERVICEMENU) *Alarm of pure water tank indicates the overflow or the pressure of the pressure reservoir has been exceeded*	• Polarity ("NO / NC") of the digital input does not correspond to the menu settings • "RO off" float sensor, liquid level sensor, pressure transmitter or output to the parent control unit is faulty	• Adjust the polarity in the service menu. Get a service technician to check if the contacts are connected properly and tightly at the corresponding terminal (by qualified personnel). • Program the tank heights correctly (in case of an analogue level sensor) • Call BWT SERVICE team
"A2 COND1 perm. high" (Alarm permeate conductivity (COND1) too high), (deactivatable / activatable in the SERVICEMENU) *The set limit value of permeate conductivity has been exceeded.*	• Membrane module(s) defective, exceeded product life cycle (e.g. furred up) • Failure at the upstream installed water softener (without a proper regeneration) and an resulting salt breakthrough at the softener unit • Delay time for the alarm is too low or the alarm limit is set too low • Damaged conductivity sensor, o-rings or return flow preventer • Incorrectly programmed cell constant or reference temperature **PICO online:** Pressure retention valve S21.07 is turned too tightly, counter pressure is too high (dilution effect caused by permeate reverse flow in front of the pump is too low).	• Call the service technician and get the faulty RO modules replaced if necessary • Determine the conductivity at the outlet of the softener unit. We recommend the use of a duplex softener instead of a single softener for reasons of operational safety. • Call BWT SERVICE team • Check the delay time and increase if necessary (at least 1 minute is recommended). Adjust the alarm limit if necessary. • Readjust the counter pressure on the pressure retention valve S21.07 if necessary

4.3 Troubleshooting - A2 alarms

Table 3.2: *Troubleshooting of A2 alarms*

Alarm text of the display:	Possible reasons:	Correction of the error:
"A2 COND2 extern. high" (Optional available, second conductivity sensor), (deactivatable / activatable in the SERVICEMENU) *The maximum permissible conductivity of the external measurement (desalination) has been exceeded. Alarm is active only when an external measurement "LW2" was activated.*	• See "COND1" • Faulty setting during installation works • Desalination cartridge (MINISTIL) is used up and has to be replaced	• See "COND1" • Isolate the errors caused by conductivity measurements in the system and replace the faulty components • Replace the desalination cartridge
"A2 Error bypass" (deactivatable / activatable in the SERVICEMENU) *The maximum bypass opening time is higher than the alarm value (service settings).* **Observe:** *Without this alarm, the bypass valve might be opened (e.g. in extreme case), a very long time, without the consumer having this registered.*	• Utilisation is constantly higher than permeate supply • Loose connection between the float sensor and terminal • "Bypass OFF" float sensor faulty • Bypass alarm was not activated (status is **"N"** in the menu parameter) • Permissible opening time of the bypass valve is too less in the program	• RO with higher capacity required • Check the wiring • Call BWT SERVICE team, exchange of defect parts • Check the settings in the service menu and adjust if necessary.
"A2 Terminal error" (deactivatable / activatable in the SERVICEMENU)	• Display plug has been disconnected at the corresponding terminal or contact detached at the plug	• Connect the plug again or check the wiring (by qualified personnel) • Ask for service, replace the faulty parts
"A2 WCF high" (deactivatable / activatable in the SERVICEMENU)	• Flow sensor F21.01 is faulty • Nominal diameter is not set correctly • Delay time or alarm limit is set too low	• Check the settings in the service menu and adjust if necessary. • Call BWT SERVICE team

4.4 Troubleshooting - A3 alarms

Table 3.3: *Troubleshooting of A3 alarms*

Alarm text of the display:	Possible reasons:	Correction of the error:
"A3 Inlet pressure low" *The A3 alarm "A3 inlet pressure low" is triggered when the inlet pressure remains low for 15s. The device then restarts automatically. If the inlet pressure of more than 1 bar is not present even after four start-up attempts, the message "A1 inlet pressure low" is displayed and the device is switched off.*	• See **"A1 Inlet pressure low"**	• See **"A1 Inlet pressure low"**

4.4 Troubleshooting - A3 alarms

Table 3.3: *Troubleshooting of A3 alarms*

Alarm text of the display:	Possible reasons:	Correction of the error:
"A3 Ext. tank empty" (deactivatable / activatable in the SERVICEMENU) *Alarm filling level of permeate tank is empty*	• Leakage of permeate tank • Permeate utilisation is constantly too high -> Tank is empty and RO cannot cope with production • Polarity ("NO / NC") of the switch does not correspond to the polarity of the connected switch • "RO on" float sensor, level sensor is faulty • Loose connection between the float / level sensor and terminal	• Locate the leakage and stop it • If the problem continues to persists, increase the distance between the "RO start" and "RO stop" contacts in the tank or use a larger tank or another PICO model with higher permeate capacity. • Adjust the polarity in the service menu. Check the connection at the corresponding terminal.
"A3 Refill Antiscalant"	• The dosing tank is almost empty in case of antiscalant dosing • If antiscalant dosing is not connected, the link could possibly be disconnected from the corresponding terminal	• Refill the dosing tank and restart the RO • Ensure that the contacts at the corresponding terminal are connected properly and tightly (by qualified personnel)
"A3 Refill NaOH"	• The dosing tank is almost empty in case of NaOH dosing • If NaOH dosing is not connected, the link could possibly be disconnected from the corresponding terminal	• Refill the dosing tank and restart the RO • Ensure that the contacts at the corresponding terminal are connected properly and tightly
"A3 Change filter" (deactivatable / activatable in the SERVICEMENU)	• The configured filter replacement interval has been exceeded –> **Note:** Replacing the disposable filter element is described in **section 5.1**.	• Replace the filter and reset the replacement interval. To do this, the countdown timer is reactivated in the service menu (click the number of days configured at this position once again using **"OK"** button to restart the counter).
"A3 Service interval" (deactivatable / activatable in the SERVICEMENU)	• The programmed service interval has been exceeded –> service must be performed	• Realisation of device maintenance by the BWT service technician • After doing this, the countdown timer has to be reactivated in the service menu (click the number of days configured at this position once again using **"OK"** button to restart the counter)
Waiting the service signal	• Link of the corresponding terminal is missing or disconnected • In dual-mode, stage 1 waits till stage 2 is in production (and can thus start up) -> Production relay of stage 1 is faulty	• Ensure that the corresponding terminal is connected properly (by qualified electrician) • Call BWT SERVICE team
"A3 Error COND1"	• Defective wire of conductivity sensor 1	• Call BWT SERVICE team
"A3 Error COND2"	• Defective wire of conductivity sensor 2	• Call BWT SERVICE team

5.1 Maintenance work

Observe: The device is largely maintenance-free, however a thorough check should be scheduled at least every 12 months. We recommend condcluding a service agreement with your local BWT Service. Please keep a record of all maintenance work as well as repair work.

5.2 Maintenance work which can be carried out by the customer

5.2.1 Change of filter elements

Depending on customer- specific requirements, the filter element should be changed periodically, at **least after 3 months**.

Filter element type W8/5 µm **Art. Nr. 9-110194** for BWT PERMAQ® Pico 10-40
Filter element type W5/5 µm **Art. Nr. 9-124536** for BWT PERMAQ® Pico 50-70

Note: The **one-way filter element** inside the **filter cup**.

Once inserted filter elements may not be used again.

Procedure:

- Open the **maintenance door**
- **Switch the device OFF**, by pressing the **main-voltage switch "0"**
- Pull out the **mains plug**

→ **Wait 2-3 minutes** allowing pressure to drop!

- Unscrew the **filter cup** with the **filter wrench**.

→ **Attention: Filter cup** is filled with **water**!

- Remove the old **filter element**, insert **new filter element**.

→ When inserting the new **filter element** pay attention to the correct centring at the top **(head)** and the **bottom (filter cup)**.

- Screw the **filter cup** with new **filter insert** onto the connection in a hand-tight manner.
- Plug in the **mains plug** of the device.
- Re-start the **device** by pressing the **main-voltage switch "I"**. Change into the **"main menu"** and activate the RO unit.
- Close **maintenance door**.

5.2.2 Change of the dosing bottle (option)

The dosage container must be changed when the error message: **"A3 Refill Antiscalant (NaOH)"** (the reserve time: approx. 2 days) is displayed, latest however when the error message: **"A2 Antiscalant empty (NaOH)"** is displayed.

Procedure:

- Unscrew and remove the dosage container
- Insert a new dosage container and screw it onto the connection in a hand-tight manner
- Acknowledge the alarm by pressing the **"OK"**-key
- Select the **"OPERATION / INTERVAL"** menu to start the device and press the **"OK"**-key

Note: When ordering the "AS dosing system for PICO", then is an additional user manual in the scope of delivery available (document no. **145315**).

5.2.3 Check the water hardness (DUROTEST® Kit)

Please carry out a weekly **check** of the feed water hardness with the **DUROTEST® Kit**.

The **DUROTEST® kit** is a reagent usable for a simple analysis of the total hardness of the softened water.
The Kit includes the **analysis liquid (1)** and a **test pipe (2)** (see **Fig. 35**).

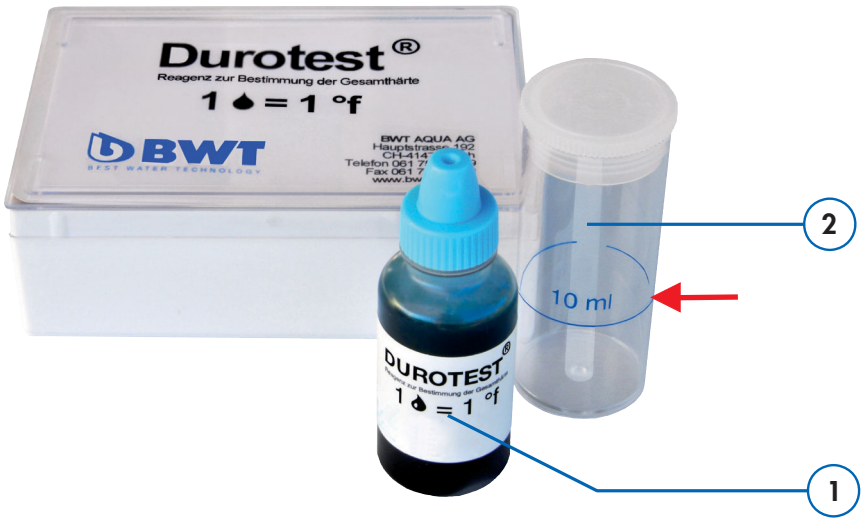


Fig. 35: *Check of the water hardness with the "DUROTEST®"*

Procedure:

- Rinse the **test pipe (2)** with softened water (preparatory work).
- Fill the soft water into the **test pipe (2)** up to the **10ml mark** (which is to be tested).
- Add the **analysis liquid (1)** dropwise into the soft water and mix it well after each drop.
- Please count the drops until the **colour changes** from **red** to **green**.
- **Each counted drop** (of the measured value) is equivalent to **1°f of water hardness** (1°f ≙ 0,561°dH).

5.3 Venting the pump

The system has to be properly vented especially after replacing a filter (even in case of chemical RO cleaning / disinfection). For this purpose, the venting valve **(1)** has to be carefully opened during the **"RO start 1"** step or during the initial disinfection steps (risk of spraying, wear safety glasses). Collect the water below the drain hose **(2)** in a container. Continue venting till only water comes out (without air).

Observe: If venting is not adequate, the chemicals are not distributed uniformly throughout the system as required, but partly remain in the filter cup. This considerably reduces the effectiveness of the disinfection / RO cleaning.

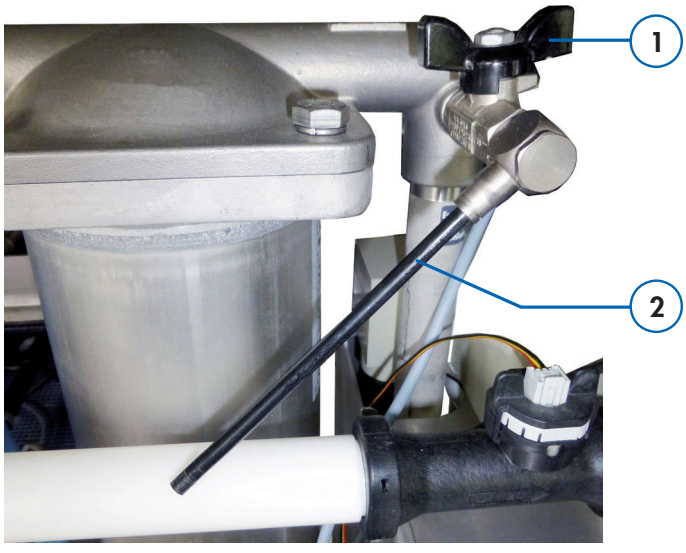


Fig. 36: *Venting valve of the RO pump*

5.4 Disinfection

An disinfection of the reverse osmosis device should be carried out according to customer specific demands for microbiological purity of the permeate.

Chemical disinfectant:

AQUARIS DES in tablet form

Test Set Peroxid – 100 test strips

The use of a new filter prior to disinfection is recommended.

The disinfection is activated by selecting the cleaning program **"DESINFECTION int."**.

Observe: Use protective goggles and put on disposable gloves.

Please ensure that the **AQUARIS DES tablets** do not come into contact with the skin!

FIRST AID IN THE EVENT OF EYE CONTACT: Rinse your eyes immediately with **plenty of clear water**. See a **physician!**

Procedure:

- Open the **maintenance door**
- **Switch the device off** by pressing the **main voltage switch** to **"0"**.

→ **Wait 2-3 minutes** allowing pressure to drop!

- Separate the flexible permeate connection leading to the storage tank and **lead the permeate hose into the drain!**
- Unscrew the **filter cup** with the **filter wrench**.

→ **Attention:** the **filter cup** is **filled with water!**

- Empty the **filter cup**. If necessary clean filter cup.

→ Fill the recommended quantity of **AQUARIS DES** in accordance with the table below into the filter. **Attention:** Fill the chemical disinfectant only into the **filter cup**!

- Screw the **filter cup** with new **filter insert** onto the connection in a hand-tight manner.
- Close the **maintenance door**
- **Start** the **device** by the **main switch "I"**.

- Please activate the program **"DESINFECTION int."** via the RO control, as described on the next page.

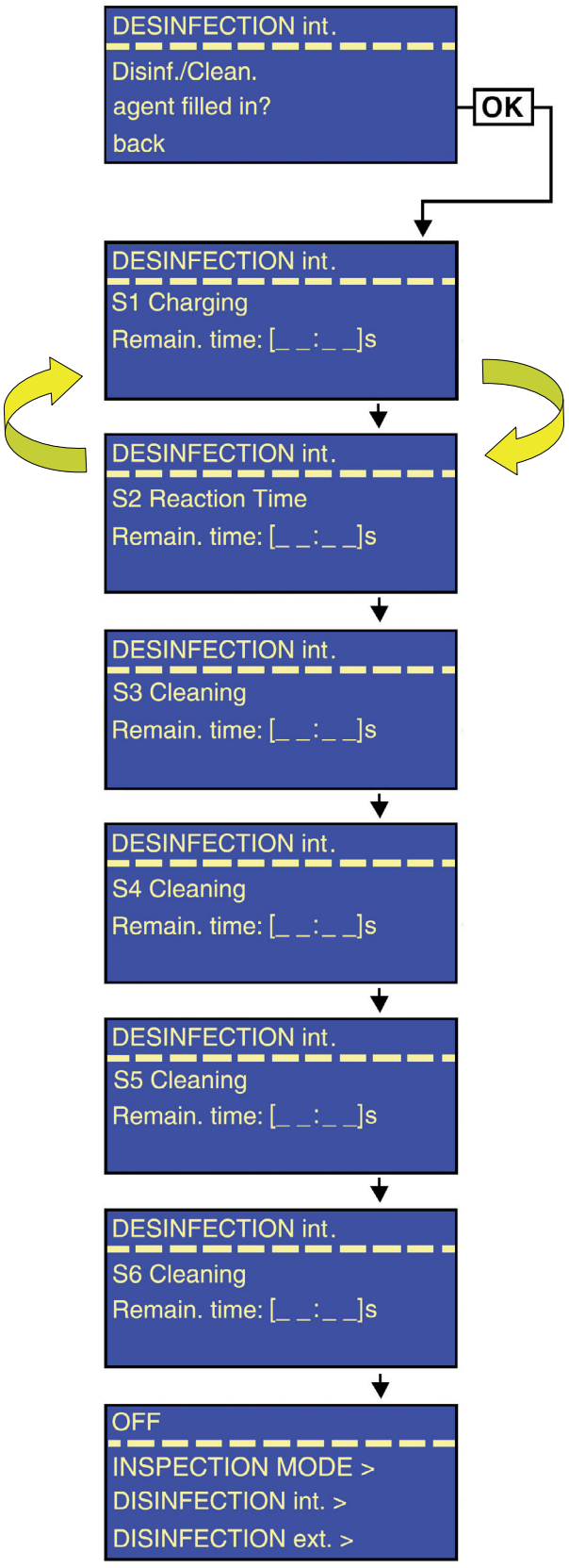


Fig. 37: *Program steps of "DISINFECTION int."*

Procedure "DESINFECTION int.":

- Select **"DESINFECTION int."** in the main menu using the arrow key and press the **"OK"** button.

- Confirm the question **"agent filled in?"** using the **"OK"** button.

→ The disinfection program runs up automatically in a stepwise routine.

- The pump is vented carefully during the **"S1 Charging"** (see **Part 5.3**).
- The device changes to the **"OFF"** status after completing the program.

→ **In case peroxide is still detected**, flushing has to be carried out accordingly and the permeate has to be discarded.

- After completing the disinfection program, check if the peroxide-containing disinfectant has been completely flushed out of the system using the peroxide test strips. If peroxide can still be detected, restart the **"DESINFECTION int."** program.
- Reconnect the RO permeate connection with the storage tank.
- Start the reverse osmosis again.

Table 4: *Dosage with disinfection tablets "AQUARIS DES"*

Dosing of cleaning agent (tablet form): AQUARIS DES	
BWT PERMAQ® Pico:	**Cleaning-tablets [Qty]**
10	6
20	9
30	9
40	12
50	15
60	18
70	20

5.5 Removing lime-scale from the membrane

After a hardness breakthrough of the softener or inadequate AS dosage as well as increased service span the salts and predominantly lime (scaling) may deposit on the RO membrane and lead to a reduction in the performance and quality. These residues can be largely removed by cleaning with the recommend chemical "AQUARIS RM".

Chemical cleaning agent: AQUARIS RM (liquid)

- **Observe:** Use protective goggles and put on disposable gloves. Please ensure that the **AQUARIS RM** liquid does not come into contact with the skin!
- **FIRST AID IN THE EVENT OF EYE CONTACT:** Rinse your eyes immediately with plenty of clear water. See a **physician**!
- **Attention:** When a cleaning cycle is carried out for the first time it is recommended to set the step **INTRODUCTION** in the program to **max. 8 sec**.
- To carry out a chemical RO cleaning the operator have to use the cleaning program **"DESINFECTION int."** also applicable for the disinfection sequence.

Procedure:

- Open the **maintenance door**
- **Switch the device off** by pressing the **main voltage switch "0"**.

→ **Wait 2-3 minutes** allowing pressure to drop!

- Separate the flexible permeate connection **leading to the storage tank and lead the permeate hose into the drain!**
- Unscrew the **filter cup** with the **filter wrench.**
  Attention: filter cup is filled with water. Empty the **filter cup.**
  Generally is the use of a new filter element recommended for the cleaning works.
- If necessary clean **filter cup** with warm water and re-insert (new) filter element.

→ Fill the prescribed quantity of **AQUARIS RM** accordingly the table below into the filter.

- **Screw the filter cup** with new filter insert onto the connection in a hand-tight manner.
- Close the **maintenance door**.
- Activate the device control, by switching the **main voltage switch** to **"I"**.
- Select **"DESINFECTION int."** with the arrow keys and press the **"OK"** key.
- Confirm the displayed prompt **"Fill cleaning agent"** with the **"OK"** key.
- The cleaning program runs up automatically in a stepwise routine.
- When the step **"S1 charging"** appears, then the pump are properly vented (see **Part 5.3**).
- If the cleaning program was finished the operator ought to check with a pH test strip, whether the alkaline cleansers was completely flushed out of the system. When the pH value is increased over a specific limit it should have a rinsing in a neutral or slightly acidic range (pH 6 ...pH 7). If the pH value is still increased, than the operator should start the program **"DESINFECTION int."** again.
- Reconnect the RO permeate connection with the storage tank.
- Start the reverse osmosis again.

[DESINFECTION int. + OK-key]

DESINFECTION int.
Desinf./Clean.
agent filled in?
back

OK

DESINFECTION int.
S1 Charging
Remain. time [__:__]s

Table 5: *Dosing of "AQUARIS RM"*

Dosing of chemical cleaning agent (liquid): AQUARIS RM	
BWT PERMAQ® Pico	**Recommended amount of chemical cleaning agent [ml]**
10	approx. 250 ml
20	approx. 400 ml
30	approx. 500 ml
40	approx. 800 ml
50	approx. 1000 ml
60	approx. 1200 ml
70	approx. 1300 ml

5.6 Shut down periods, Recommissioning

Decommissioning:

Attention:

- Pull the electrical plug out of the mains socket.
- Close of the reverse osmosis shut-off valve.
- Depressurise the device. If present, open the bypass valve.
- The reverse osmosis is now separated from the water line and the connection hoses can be dismantled.
- If you intend to decommission the device for a longer period, please contact our customer service.

Recommissioning:

Attention:

- Recommissioning after a longer standstill should be carried out by a BWT service on principle.
- In adverse cases, for example longer downtimes in warm places, a additional will become necessary.

Storage conditions:

Observe:
Storage of the device!
Conservation of the device!

- The storage room/area must be dry and clean.
- Device must be protected from chemicals, dyes, solvents and fumes.
- Storage of the RO only at temperatures of 5°C - 35°C.
- Storage of the RO only at a relative humidity of 30% - 85% non-condensing.
- We recommend that you secure the device against unauthorised access while it is stored.
- **Avoid unnecessary long storage periods** of the device to avoid the risk of standstill contaminations.

Disinfect the device if it is stored for more than two weeks.

Storage: Store the chemical disinfection product in a cool place, close tightly after use and use only clean containers for mixing the disinfection solution.

After disinfection and frst commissioning the water quality should be examined.

5.7 Disposal

Procedure: The device consists of various materials which need to be disposed of properly.
Please order the manufacturer customer service for an expert and environmentally compliant disposal.
Disposal of any electrical parts should only be carried out at authorised WEEE recycling centres.

5.8 Maintenance and wearing parts

To guarantee the best level of hygiene safety, efficient working and long life for the device, we would recommend you carry out a regular visual check of the device (at least once a week).

Note: To ensure reliable production and to meet our customer requirments, our company offers the conclusion of a service contract.

Observe: Only original BWT replacement parts will offer optimum security, availability and sustainability of your product.

Table 6: *Replacement of wear parts (for* **Part. 5.8***)*

Maintenance work:	Responsible:	Recommended maintenance interval:
✔ **General visual inspection**	Customer	Weekly
✔ **Check of tightness**	Customer	Weekly
✔ **Cleaning with a moist cloth**	Customer	As required
✔ **Feed water quality (Water hardness test)**	Customer	Weekly, as required
➤ **Conductivity (Reference measurements with hand-held unit)**	Service	At least, once a year
➤ **Disinfection RO-device (AQUARIS DES)**	Customer/Service	As required
➤ **Chemical cleaning of RO-device (AQUARIS RM)**	Customer/Service	As required
➤ **Exchange membrane elements**	Service	As required
➤ **Check of the pressure switch, solenoid valves**	Service	At least, once a year
➤ **Check of the float sensor for level**	Service	At least, once a year
➤ **Exchange of connections/pressure hoses**	Service	Every 5 years
➤ **Backup battery, type CR 2032**	Customer, service	As required

6.1 Technical data BWT PERMAQ® Pico 10 - 70 on/off

BWT PERMAQ® Pico on/off	Model	10	20	30	40	50	60	70
Flow offline, free run-off 1)	l/h	> 180	> 330	> 480	> 580	> 1150	> 1620	> 1950
Flow offline, free run-off 2)	l/h	> 200	> 370	> 540	> 650	> 1250	> 1800	> 2100
Flow online, 3.0 bar counter pressure 1)	l/h	> 140	> 260	> 380	> 450	> 900	> 1300	> 1500
Flow online, 3.0 bar counter pressure 2)	l/h	> 160	> 290	> 430	> 510	> 1000	> 1400	> 1600
Salt retention rate	%	97			98			
Permeate output WCF (min./max.)	%	70 / 80			70 / 80			
Feedwater								
Feed water pressure (min./max.)	bar	2.5 / 6.0			2.5 / 6.0			
Temperature of feed water (min./max.)	°C	5 / 30			5 / 30			
Hardness	°fH	0.0			0.0			
Iron and manganese (Fe+Mn)	mg/l	< 0.1			< 0.1			
Salt level, Total Dissolved Solids (TDS)	mg/l	< 1.000			< 1.000			
Silt Density Index (SDI)	%/min	< 3			< 3			
Oxydants	mg/l	< 0.05			< 0.05			
General								
Raw water / Permeate / Concentrate	inch/ mm	3/4" / 3/4" / concentrate-hose 13mm concentrate-hose FT version 8mm			3/4" (only Pico 70: 1") / 3/4" (only Pico 70: 1") / concentrate-hose 13mm concentrate-hose FT version 8mm			
Protection class	IP	63			63			
Ambient temperature (min./max.)	°C	5 / 35			5 / 35			
Electric power supply / fuse protection	V/Hz/A	400/ 50/ 10			400/ 50/ 10			
Electric power consumption	kW	0.85			1.6	2.3	2.3	3.1
Type of valve		24V DC			24V DC			
Standard of connector		CEE 16; 3PNE			CEE 16; 3PNE			

1) **Feed water:** TDS ≤ 1'000mg/l; 15°C; 2.5 bar

2) **Feed water:** TDS ≤ 1'000mg/l; 15°C; 4.0 bar

PERMAQ® Pico online = ON	10 ON	20 ON	30 ON
Production and Item No.	6-473249	6-473250	6-473251

PERMAQ® Pico online & liquid flow metering	10 ON & FT	20 ON & FT	30 ON & FT
Production and Item No.	6-473263	6-473264	6-473265

PERMAQ® Pico offline = OFF	10 OFF	20 OFF	30 OFF
Production and Item No.	6-473242	6-473243	6-473244

PERMAQ® Pico offline & liquid flow metering	10 OFF & FT	20 OFF & FT	30 OFF & FT
Production and Item No.	6-473256	6-473257	6-473258

PERMAQ® Pico online = ON	40 ON	50 ON	60 ON	70 ON
Production and Item No.	6-473252	6-473253	6-473254	6-473255

PERMAQ® Pico online & liquid flow metering	40 ON & FT	50 ON & FT	60 ON & FT	70 ON & FT
Production and Item No.	6-473266	6-473267	6-473268	6-473269

PERMAQ® Pico offline = OFF	40 OFF	50 OFF	60 OFF	70 OFF
Production and Item No.	6-473245	6-473246	6-473247	6-473248

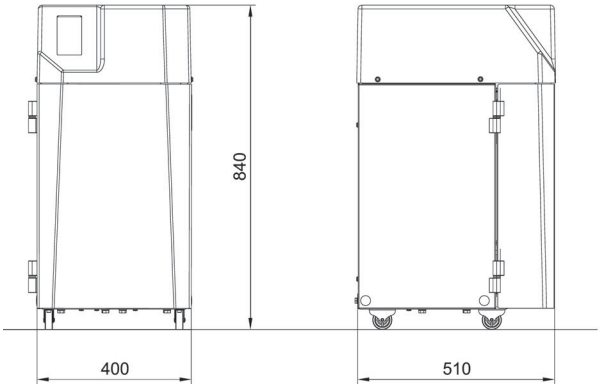
PERMAQ® Pico offline & liquid flow metering	40 OFF & FT	50 OFF & FT	60 OFF & FT	70 OFF & FT
Production and Item No.	6-473259	6-473260	6-473261	6-473262

6.1.1 Dimensions BWT PERMAQ® Pico 10 - 70 on/off

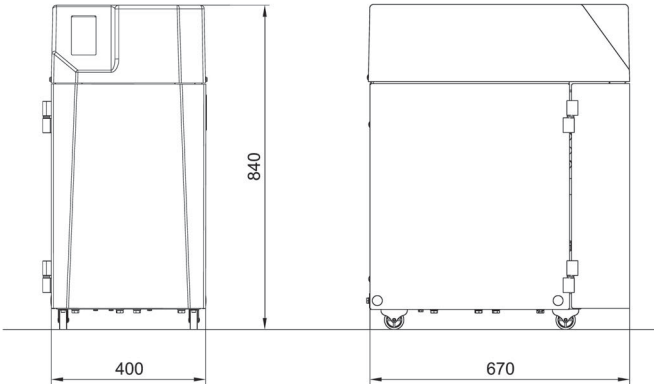
BWT PERMAQ® Pico on/off	Model	10	20	30	40	50	60	70
Dimensions								
Width x Depth	mm	400 x 510	400 x 670	400 x 670	400 x 510	400 x 670		
Height	mm	840			1500			
Weight	kg	80	95	110	105	130	140	150
Dimensions packing included								
Width x Depth	mm	420 x 530	420 x 690	420 x 690	420 x 530	420 x 690	420 x 690	420 x 690
Height	mm	890			1550			

Dimension drawings:

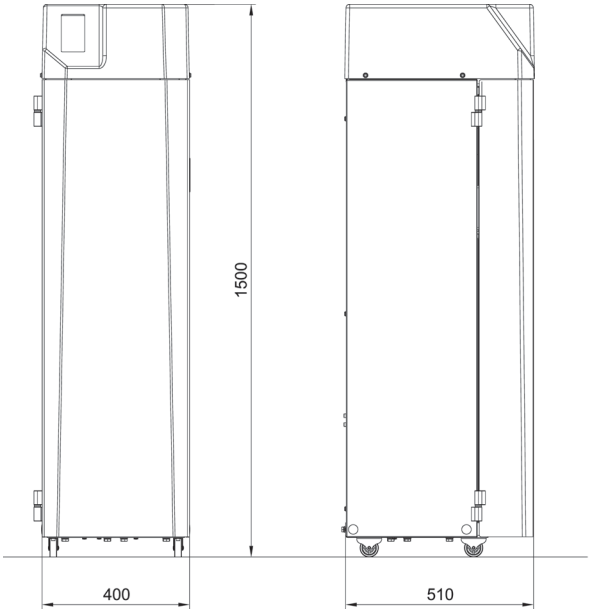
BWT PERMAQ® Pico 10 on/off



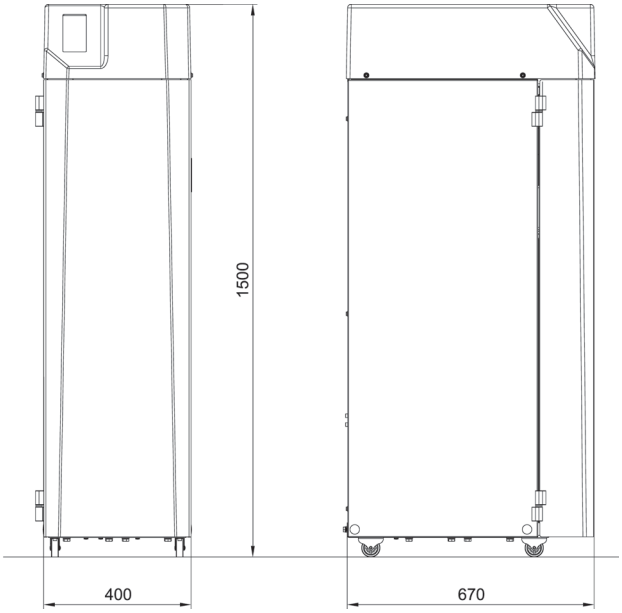
BWT PERMAQ® Pico 20-30 on/off



BWT PERMAQ® Pico 40 on/off



BWT PERMAQ® Pico 50-70 on/off



BWT PERMAQ® Pico on/off

The model for building services engineering and industrial applications

6.2 Technical data BWT PERMAQ® Pico 40 - 70 HR on/off

BWT PERMAQ® Pico on/off	Model	40	50	60	70
Flow offline, free run-off 1)	l/h	> 380	> 830	> 1035	> 1380
Flow offline, free run-off 2)	l/h	> 410	> 920	> 1150	> 1550
Flow online, 3.0 bar counter pressure 1)	l/h	> 355	> 770	> 965	> 1265
Flow online, 3.0 bar counter pressure 2)	l/h	> 380	> 840	> 1055	> 1350
Salt retention rate	%	99			
Permeate output WCF (min./max.)	%	70 / 80			
Feedwater					
Feed water pressure (min./max.)	bar	2.5 / 6.0			
Temperature (min./max.)	°C	5 / 30			
Hardness	°fH	0.0			
Iron and manganese (Fe+Mn)	mg/l	< 0.1			
Salt level, Total Dissolved Solids (TDS)	mg/l	< 1.000			
Silt Density Index (SDI)	%/min	< 3			
Oxydants	mg/l	< 0.05			
General					
Raw water / Permeate / Concentrate	inch/ mm	3/4" (only Pico 70: 1") / 3/4" (only Pico 70: 1") / concentrate-hose 13mm concentrate-hose FT version 8mm			
Protection class	IP	63			
Ambient temperature (min./max.)	°C	5 / 35			
Electric power supply / fuse protection	V/Hz/A	400/ 50/ 10			
Electric power consumption	kW	1.6	2.3	2.3	3.1
Type of valve		24V DC			
Standard of connector		CEE 16; 3PNE			

1) Feed water: TDS ≤ 1'000mg/l; 15°C; 2.5 bar
2) Feed water: TDS ≤ 1'000mg/l; 15°C; 4.0 bar

BWT PERMAQ® Pico HR online = ON	40 HR ON	50 HR ON	60 HR ON	70 HR ON
Production and Item No.	**6-473280**	**6-473281**	**6-473282**	**6-473283**

PERMAQ® HR Pico online & liquid flow metering	40 HR ON & FT	50 HR ON & FT	60 HR ON & FT	70 HR ON & FT
Production and Item No.	**6-473294**	**6-473295**	**6-473296**	**6-473297**

PERMAQ® HR Pico offline = OFF	40 HR OFF	50 HR OFF	60 HR OFF	70 HR OFF
Production and Item No.	**6-473273**	**6-473274**	**6-473275**	**6-473276**

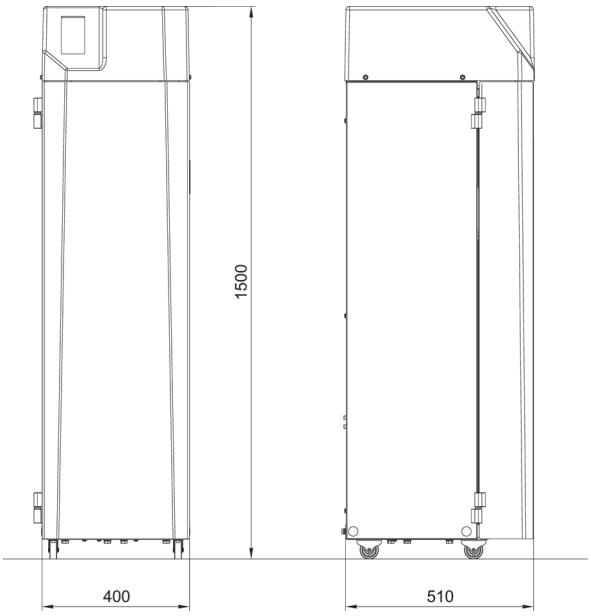
PERMAQ® HR Pico offline & liquid flow metering	40 HR OFF & FT	50 HR OFF & FT	60 HR OFF & FT	70 HR OFF & FT
Production and Item No.	**6-473287**	**6-473288**	**6-473289**	**6-473290**

6.2.1 Dimensions BWT PERMAQ® Pico 40 - 70 HR on/off

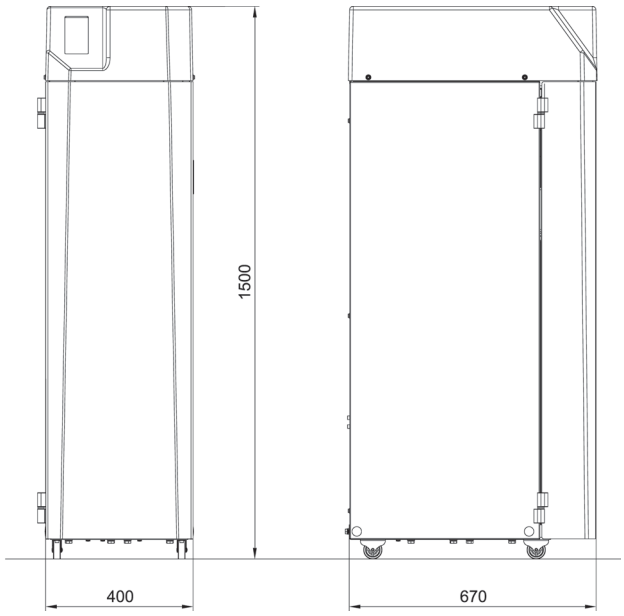
BWT PERMAQ® Pico HR on/off	Model	40	50	60	70
Dimensions					
Width x Depth	mm	400 x 510	400 x 670		
Height	mm	1500			
Weight	kg	105	130	140	150
Dimensions packing included					
Width x Depth	mm	420 x 530	420 x 690	420 x 690	420 x 690
Height	mm	1550			

Dimension drawings:

BWT PERMAQ® Pico 40 HR



BWT PERMAQ® Pico 50-70 HR



BWT PERMAQ® Pico HR on/off

The model with increased TDS

6.3 Technical data BWT PERMAQ® Pico 20/10 - 70/60 Duo

BWT PERMAQ® Pico Duo	Model	20/10	30/20	50/40	60/50	70/60
Flow offline, free run-off 1) includes a concentrate return system 1)	l / h	> 180	> 330	> 580	> 1150	> 1620
Flow offline, free run-off 2) includes a concentrate return system 1)	l / h	> 200	> 370	> 650	> 1250	> 1800
Salt retention rate	%	99.0		99.5		
Permeate output WCF (min./max.)	%	75 / 80		75 / 80		
Feedwater						
Feed water pressure (min./max.)	bar	2.5 / 6.0		2.5 / 6.0		
Feed water temperature (min./max.)	°C	5 / 30		5 / 30		
Hardness	°fH	0.0		0.0		
Iron and manganese (Fe+Mn)	mg / l	< 0.1		< 0.1		
Salt level, Total Dissolved Solids (TDS)	mg / l	< 1.000		< 1.000		
Silt Density Index (SDI)	%/min	< 3		< 3		
Oxydants	mg / l	< 0.05		< 0.05		
General						
Raw water / Permeate / Concentrate	inch/ mm	3/4" / 3/4" / concentrate-hose 13mm concentrate-hose FT version 8mm		3/4" (only Pico 70: 1") / 3/4" (only Pico 70: 1") / concentrate-hose 13mm concentrate-hose FT version 8mm		
Protection class	IP	63		63		
Ambient temperature (min./max.)	°C	5 / 35		5 / 35		
Electric power supply / fuse protection	V/Hz/A	400/ 50/ 10		400/ 50/ 10		
Electric power consumption	kW	2 x 0.85		1.6 & 2.3	2 x 2.3	2.3 & 3.1
Type of valve		24V DC		24V DC		
Standard of connector		CEE 16; 3PNE		CEE 16; 3PNE		

1) Feed water: TDS ≤ 1'000mg/l; 15°C; 2.5 bar

2) Feed water: TDS ≤ 1'000mg/l; 15°C; 4.0 bar

PICO DUO - ASSEMBLY CONNECTION TOOL SET	Type: 10-30	Type: 40-60	Type: 70/60
Production and Item No.	**6-473224**	**6-473217**	**6-473218**

Note: The Pico Duo consists of an **online RO** and an downstream installed **offline RO** which is connected with an **"assembly connection tool set"**.

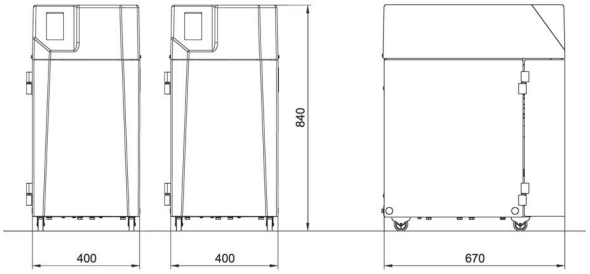
6.3.1 Dimensions BWT PERMAQ® Pico 20/10 - 70/60 Duo

BWT PERMAQ® Pico Duo	Type	20/10	30/20	50/40	60/50	70/60
Dimensions						
Width	mm	2 x 400		2 x 400		
Depth	mm	2 x 510	2 x 670	510 & 670	2 x 670	2 x 670
Height	mm	840 & 840		1500 & 1500		
Weight	kg	2 x 80	2 x 95	105 & 130	2 x 140	140 & 150
Dimensions packing included						
Width	mm	2 x 420		2 x 420		
Depth	mm	2 x 530	2 x 690	530 & 690	2 x 690	2 x 690
Height	mm	890 & 890		1550 & 1550		

Dimension drawing:

BWT PERMAQ® Pico 20/10 Duo

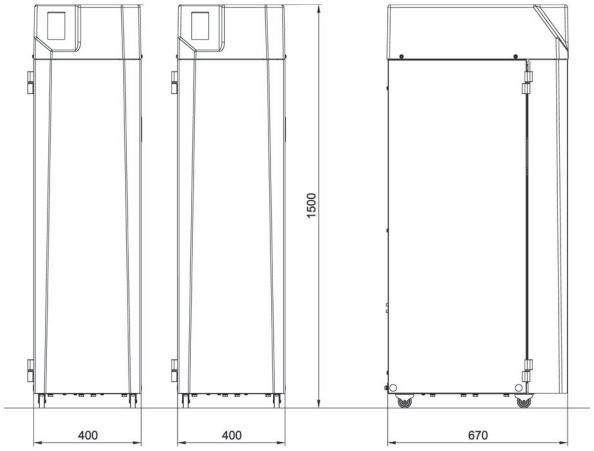
BWT PERMAQ® Pico 30/20 Duo



BWT PERMAQ® Pico 50/40 Duo

BWT PERMAQ® Pico 60/50 Duo

BWT PERMAQ® Pico 70/60 Duo



BWT PERMAQ® Pico Duo

The model for ultimate water quality

CE Declaration of conformity

EG Konformitätserklärung / Certificat de conformité CE

The company **BWT Wassertechnik GmbH** declares that **the devices for reverse osmose** with the following specifications:

Trade name of product:	**Type of product:**	**Model:**
• **BWT PERMAQ® Pico**	**on/off**	**(10, 20, 30, 40, 50, 60, 70)**
• **BWT PERMAQ® Pico**	**HR on/off**	**(40, 50, 60, 70)**
• **BWT PERMAQ® Pico**	**Duo**	**(20/10, 30/20, 50/40, 60/50, 70/60)**

with a **serial number**: see rating plate & technical specifications

and with a **production- and Reference No.:** see rating plate & technical specifications

have been **designed, manufactured** and **assembled according** to the following **EC Directives (guidelines):**

2004/108/EC Guideline for electromagnetic compatibility

2006/95/EC Low Voltage Directive

for the design of the device the following **harmonised guidelines** were applied:
EN 61000-6-2, EN 61000-6-4, EN 61010-1, EN 60204-1

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Schriesheim, July 2014
Place, date / *Ort, Datum / Lieu, date*

Lutz Hübner,
Managing Director BWT Wassertechnik GmbH

For You and Planet Blue.

BWT
BEST WATER TECHNOLOGY

Art. No.: 9-142645 / Rev. 1.06 - EN / BWT PERMAQ® Pico / 2014-07

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