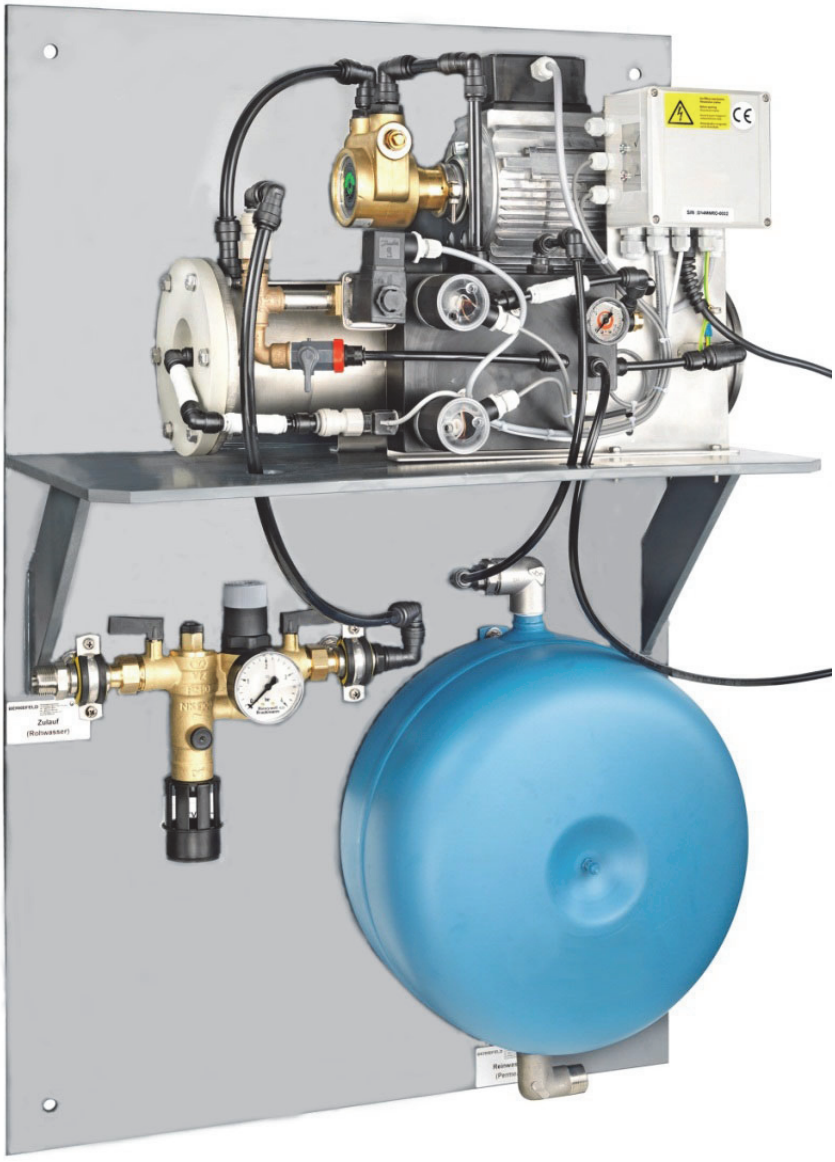
HYGROMATIK®

Manual

Reverse osmosis plants

WL-ROB-170
WL-RO-170



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WLROB170.EN

Warning! Hazardous Voltage: All work to be performed by trained personnel only. All electrical installation and servicing of the electrical components of this unit to be performed by qualified electricians only. Disconnect power supply before installation and servicing!

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1. About this documentation

1.1 Intended use

This system is a water treatment system for preparing drinking water, according to current drinking water standards for desalinated water (conductivity: from 5 to 20 µS/cm). Desalinated water may e.g. be used for filling humidifiers or any other system that can be operated using desalinated water.

All components and operating equipment used in the system are directly or indirectly required to ensure the desired treatment result.

Any use of the plant and the water produced that differs to that described in this document is considered to be improper.

The use of components and equipment for other purposes than their use in the system, as well as the drawing of water for purposes other than the specified use is deemed improper. **The water produced, e.g., must not be used as drinking water.**

HygroMatik GmbH accepts no liability for damages that occur as a result of improper use. The risks associated with improper use lie solely with the operator.

PLEASE NOTE

In order to protect against flooding caused by supply or product water or drained water, the device location should feature a pressureless floor grid. In case of non-existance, proper safety precautions for leakage protection must be considered. Hygro-Matik may not be held responsable for any damage resulting from disregard of this recommendation.

PLEASE NOTE

Use of a prefilter (E-7705200) and a 10 µm particle filter (E-7621028) is recommended.

1.2 Structure

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1.3 Depictions

1.3.1 Action steps

Step	Action	Result
1	Follow this instruction	Description of result after execution of the instruction
2	...	...

1.3.2 Safety instructions and information notes

In this document, general, basic and specific safety precautions are given to draw attention to dangers in handling the system and to unavoidable residual risks in the operation of the plant.

WARNING!

... indicates a potentially dangerous situation, that could lead to death or serious injury, if not avoided..

CAUTION!

... indicates a potentially harmful situation in which the system or an object could be damaged in their surroundings.

PLEASE NOTE

... points to information to better understand the complex processes, for efficient and trouble-free operation.
Notes basically contain no safety instructions.

Danger due to electric current

DANGER!

... identifies hazards caused by electric current. Ignoring the safety instructions can result in severe injury or death

1.4 The documentation is part of the system

These Operating and maintenance instructions are part of the system. Keep this document to hand during the entire life cycle of the system and add any changes, that you receive from HygroMatik GmbH.

1.5 Customer service

In the following cases, contact HygroMatik GmbH customer service:

- Ordering replacement parts
- Troubleshooting
- Maintenance

For contact data, s. section 1.2 .

2. Safety

The system is constructed and built according to the standards to be adhered to, as well as other technical specifications. The system therefore is in line with state-of-the-art technology and achieves the highest degree of safety during operation.

Safety instructions

The safety instructions contained in these Operating and maintenance instructions and other country-specific regulations and instructions must be read carefully and strictly adhered to, in order to reduce possible health hazards and prevent dangerous situations.

In this chapter, general safety precautions are given to draw attention to dangers in handling the system and to unavoidable residual risks.

Action-related safety instructions are preceded by the corresponding instructions.

The chapter on "Safety" is of fundamental importance and must be carefully read and strictly observed. This is the only way to ensure that all operations and tasks on the system are carried out safely and correctly.

Failure to observe the safety instructions can result in danger to persons and material damage to the system.

2.1 Measures for safe operation

The safety of the system during operation can then only be achieved if all the measures required for this have been taken. The operator is required to plan and execute, as well as review, these measures as a matter of due diligence.

Proper use and condition of the system

The operator must ensure that ...

- the system is only used as properly intended.
- the system is only operated when in faultless, functional condition.
- the system is not changed or added to without authorisation.

Personnel

The operator must ensure that only qualified, authorised personnel operate and service the system.

Personal protective equipment and information and warning signs

The operator must ensure that ... …

- the required personal protection equipment is available and worn by qualified and authorised personnel.

- all information and warning signs affixed to the system are not removed and are legible.

Training in occupational safety and environmental protection

The operator must ensure that qualified, authorised personnel are regularly trained in all questions relating to occupational safety and environmental protection.

Operating and maintenance instructions

The operator must ensure that ...

- the Operating and maintenance instructions are always present, legible and complete at the place of use of the system.the Operating and maintenance instructions and in particular, the safety notes contained therein are familiar.

2.2 Personnel

WARNING!

Risk of injury/material damage due to insufficient experience

Improper use of the system can lead to personal injury and damage.

Therefore:

- Activities on the system may only be carried out by named, qualified and authorised personnel.
- Essentially, people may only be permitted to work on the system if they are expected to perform the work reliably.
- People who are under the influence of drugs, alcohol or medication are not permitted.

The following qualification requirements are imposed on personnel:

- Qualified, experienced specialists
- Knowledge of pipeline and plant construction as well as water treatment
- Knowledge and experience of handling the preparation of the piping material and connections to be laid
- Knowledge of the following standards:
  DIN 1988
  DIN EN 1717
  DIN EN 806

2.3 Personal protective equipment

In order to minimise danger to health, personal protective equipment must be worn when handling the system.

Note the information signs affixed to work areas regarding per-

sonal protective equipment.

Protective work wear

Protective work clothing is considered to be close fitting work clothes with low tensile strength, tight sleeves and with no protruding parts. Its main purpose is to prevent staff from being caught in moving machine parts.
Do not wear rings, chains or other jewellery.

Safety shoes

To protect against heavy falling parts and sliding on slippery surfaces.

2.4 Safety-conscious working

CAUTION!

Risk of injury caused by tripping or slipping

Dirt and scattered objects create slipping and tripping hazards and can cause injury.

Therefore:

- Wear personal protective equipment.
- Always keep the work area sufficiently lit and clean.
- Remove unneeded objects from the system work area, if they are not required for production.
- Take note of potential slip and trip points in the work area of the system.

Before switching on

Before switching on the system, check ....

- whether there is damage to mechanical connections (e.g. hose and screw connections) or electrical connections due to vibrations or shocks, etc.
- that only authorised persons remain in the work area of the system.
- that no one can be injured by starting up the system.

Before starting production

Before starting production, check and ensure that ...

- there is no visible damage to the system and that the system is only operated in fault-free condition.

The system cannot be started before any identified faults have been corrected.

- all safety equipment functions properly.

3. Transport and storage

3.1 Transport notes

- Transport system carefully, do not throw.

3.2 Scope of supply

The following components are mounted on a securing and fixing plate:

- Reverse osmosis system
- Raw water inlet valve
- Pressure vessel
- Concentrate hose
- Sampling valve and pressure gauge in the permeate outlet

3.3 Inspecting for correctness and completeness

When you receive the goods, ensure that:

- the equipment is complete and all parts are in perfect condition.

Any transport damages and/or missing parts must be reported immediately to the shipper or supplier. The periods in which notification of the transport company must occur for the purposes of identifying the damage are as follows*:

Transport company	Time after receipt of goods
Rail and road transport companies	4 days at the latest
Parcel services	immediately

* Periods are subject to change without notice.

3.4 Storage

CAUTION!

Danger of material damage

Storage location requirements:

- Dry
- Cool and frost-free (permitted ambient temperature: 5 - 35° C)

3.5 Preservation

CAUTION!

Danger of material damage

The systems are factory preserved to protect the membrane from germs.

- The system must be commissioned, by the latest after three months, or re-preserved.
- Preserved systems have to be rinsed out during initial commissioning, as such the permeate produced must be directed into a waste water channel. See chapter 7.

4. System description

4.1 Principle of osmosis/reverse osmosis

Osmosis

Osmosis is a natural process in which water from a solution with low salt concentration passes through a semi-permeable membrane into a solution with a higher salt concentration.

Reverse osmosis

In reverse osmosis, the natural process of osmosis is reversed using pressure. If pressure is exerted on the side with higher concentration than the natural osmotic pressure, pure water from the solution diffuses through the semi-permeable membrane.

The pure water generated by a reverse osmosis system is referred to as "permeate", the concentrated solution as "concentrate".

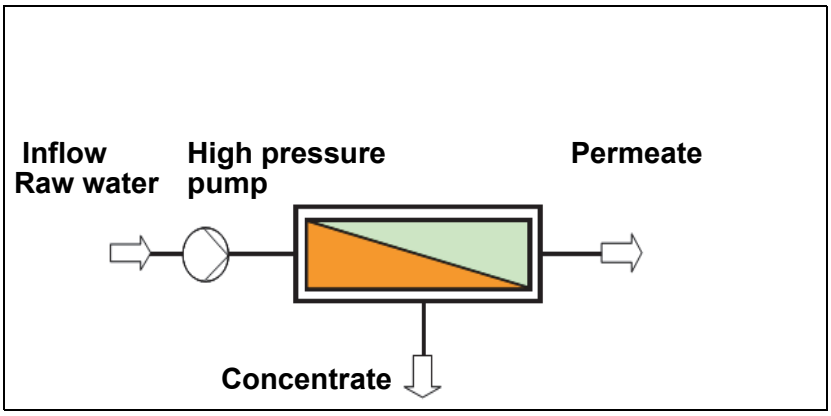


Fig. 1: Principle of osmosis/reverse osmosis

Concentrate recycling

To increase the flow through the membrane, part of the concentrate is returned to the raw water inlet.

4.2 Overview of components

System separator

The system separator prevents water from the water treatment plant from flowing back into the drinking water network or being pressurised back or sucked back (protection up to and including fluid category 4 according to DIN EN 1717).

A dirt trap is integrated into the system separator. Particles from the untreated water are caught here.

Pressure regulator (connected to system separator)

The pressure regulator lowers the inlet side pressure (admission pressure) to the desired pressure on the outlet side. The outlet pressure is set to the maximum permitted input pressure of the reverse osmosis, using a control dial.

Reverse osmosis

Reverse osmosis serves to transform drinking water according to the applicable drinking water regulations into desalinated water for filling humidifiers or any other system that may be operated using desalinated water.

Reverse osmosis includes:

- Automatic valve in the raw water inlet
- Pressure switch to monitor the inlet pressure in the raw water (dry-run protection for the high-pressure pump)
- High-pressure pump (isolation valve pump)
- Stainless steel pressure pipe
- Powerful low-energy membrane
- Two non-return valves in the permeate line
- Pressure gauge, valve and non-return valve to adjust the concentrate recycling
- Flowmeter for permeate flow
- Pushbutton for switching on and off
- Conductivity measuring cell
- Connecting pipework

Pressure vessel

Following reverse osmosis, a pressure vessel is installed that is filled with permeate during operation.
When production is ceased for stand-by mode, in the event of a minor pressure drop in the system to be filled treated water from the pressure vessel is fed in. The water treatment plant will only resume work when the pressure vessel is empty.

The purpose of using a pressure vessel is to prevent frequent switching on and off of the water treatment system due to minor pressure drops in the system to be filled.

Sampling valve/pressure gauge

A sampling valve and pressure gauge are installed in the permeate line.

To determine the water quality of the permeate, e.g., the conductivity, water samples can be taken via the sampling valve.

The current pressure in the pressure vessel can be monitored by help of the pressure gauge.

Control device

A control device is provided to control and monitor functional processes and monitor limit values. Two LED signal lamps allow for determining system state.

4.3 Functional description

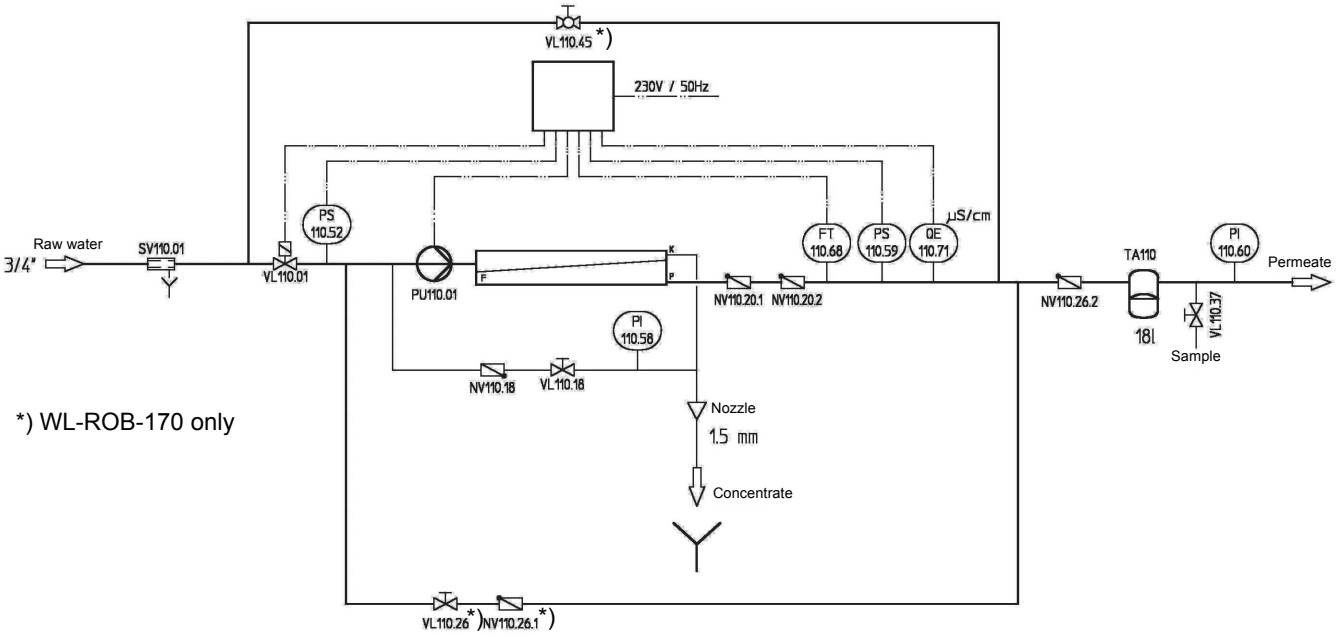


Fig. 2: Flow chart

Function	Description
Monitor inlet pressure of raw water	The PS110.52 pressure switch monitors the raw water inlet pressure. If the required input pressure drops below minimum, the system enters malfunction mode after a time delay: the red LED flashes quickly.
Increase water pressure	The PU110.01 high-pressure pump increases the water pressure up to specified operating pressure and feeds water into the membrane.
Monitor permeate volume flow	The permeate volume flow is monitored by the FT110.68 flowmeter. If the volume flow reaches a defined warning threshold value (i.e. **50 l/h**), the red LED starts to flash slowly (after a time delay). If the volume flow reaches the defined alarm threshold value (i.e. **40 l/h**), the system shuts down.
Monitor pressure in permeate pipe (of the system to be filled)	In the permeate pipe, the PS110.59 pressure switch is installed for monitoring the permeate pressure. If the pressure set on the pressure switch is achieved in the system to be filled, the system is shut down. The system resumes operation automatically when the pressure in the system to be filled drops off again and falls below the pressure set on the pressure switch.

Monitor permeate quality	The quality of the permeate is monitored via the conductivity measuring cell (QE110.71). This measurement does not necessarily reflect the pure water quality since it may have been altered by means of blending with raw water. If the conductivity reaches a defined warning threshold value (i.e **80 µS/cm**), the red LED illuminates (after a time delay). If the conductivity reaches the defined alarm threshold value (i.e. **100 µS/cm**), the system shuts down.
Bypass (ROB plant only)	With the VL110.45 bypass valve, the water treatment system can be bypassed. As such, in the event of a malfunction of the water treatment system e.g., raw water, i.e. untreated water, can still be provided.
Blending (ROB plant only)	The blending armature VL110.26 and a non-return valve are installed in the raw water pipe. The blending armature allows for adjusting pure water quality continously from raw water quality to permeate quality (conductivity 5 to 20 µS/cm). Blending the permeate with raw water is achieved via the blending pipe.

Adjust concentrate return rate

CAUTION!

Hazzard of HP pump destruction

Pressure indicated by pressure gauge PI110.58 must not exceed 14 bar.

Please note

Concentrate return rate may only be adjusted by HygroMatik GmbH service personnel or HygroMatik service partners.

Function	Description
Adjust concentrate return rate (only to be accomplished by trained people)	Valve VL110.18 allows for setting the permeate/premeate return ratio and the permeate/concentrate ratio. Pressure is monitored by pressure gauge PI110.58. **Further opening the valve**: • Lower pressure • More concentrate returned • Less permeate **Further closing the valve**: • Higher pressure • Less concentrate returned • More permeate

5. Technical Data

5.1 Raw water requirements regarding water quality

The system may only be operated with **water that is free of iron and manganese**.

Water **salinity** must not exceed **750 mg/l**.

Chlorine concentration in the water must not amount to greater than **0.1 mg/l**.

If **water hardness** does not exceed a maximum of **25 °dH** (**12 °dH KH**), the system may be operated without pretreatment by a softening device. Otherwise, a softening plant must be installed upstream in order to replace the calcium and magnesium salts contained in the water for neutral salts. Failure to observe these hints may leed to hardness precipitation and membrane blocking.

5.2 Raw water requirements regarding pressure

Inlet pressure of the raw water must be **at least 2 bar** and must not exceed **a maximum of 6 ba**r (inlet pressure is restricted by the pressure regulator set to 6 bar).

In order to allow for blending the permeate with raw water, inlet pressure of the raw water must be **1 bar beyond permeate pressure**. Permeate pressure may be monitored by means of the PI110.60 pressure gauge.

5.3 Permeate quality

The plant has a desalination rate of 96 to 98 %. As such, permeate with a **conductivity from 5 to 20 µS/cm** is produced from typical drinking water complying with valid drinking water regulations. In case of water with heavy mineral loading, however, conductivity may be significantly higher.

5.4 Performance data

Technical data	Unit	Value
Permeate volume flow*	l/h	170
Required raw water flow*	l/h	ca. 340
High pressure pump volume	l/h	1000
Membrane inlet pressure (pressure after high-pressure pump)	bar	8 - 12
Concentrate volume flow*	l/h	ca. 90
Concentrate return volume flow	l/h	620
Desalination rate	%	ca. 96 - 98
Yield*	%	ca. 50
Operating pressure (maximum)	bar	14
High pressure pump motor power	kW	0,56
High pressure pump pumping head	m	80 - 140
Permitted operating temperature range	°C	5 - 25
Permitted ambient temperature range	°C	5 - 35
Pressure switch pressure range (raw water)	bar	1 - 3,5
Pressure switch pressure range (permeate)	bar	1 - 3,5
Raw water inlet pressure (minimum/maximum) ** Plants with blending feature: Raw water inlet pressure 1 bar beyond permeate pressure minimum	bar	2**/6
Empty weight/Operating weight	kg	ca. 30/48

Technical data	Value
Electrical connection	230 VAC, 50 Hz
Protection class	IP 54/65
Raw water intake connection	¾ “
Permeate outlet connection	¾ “

* depending on raw water quality (membrane presumed to be like new) and T_{Water} = 15° C.

5.5 Dimension sheet

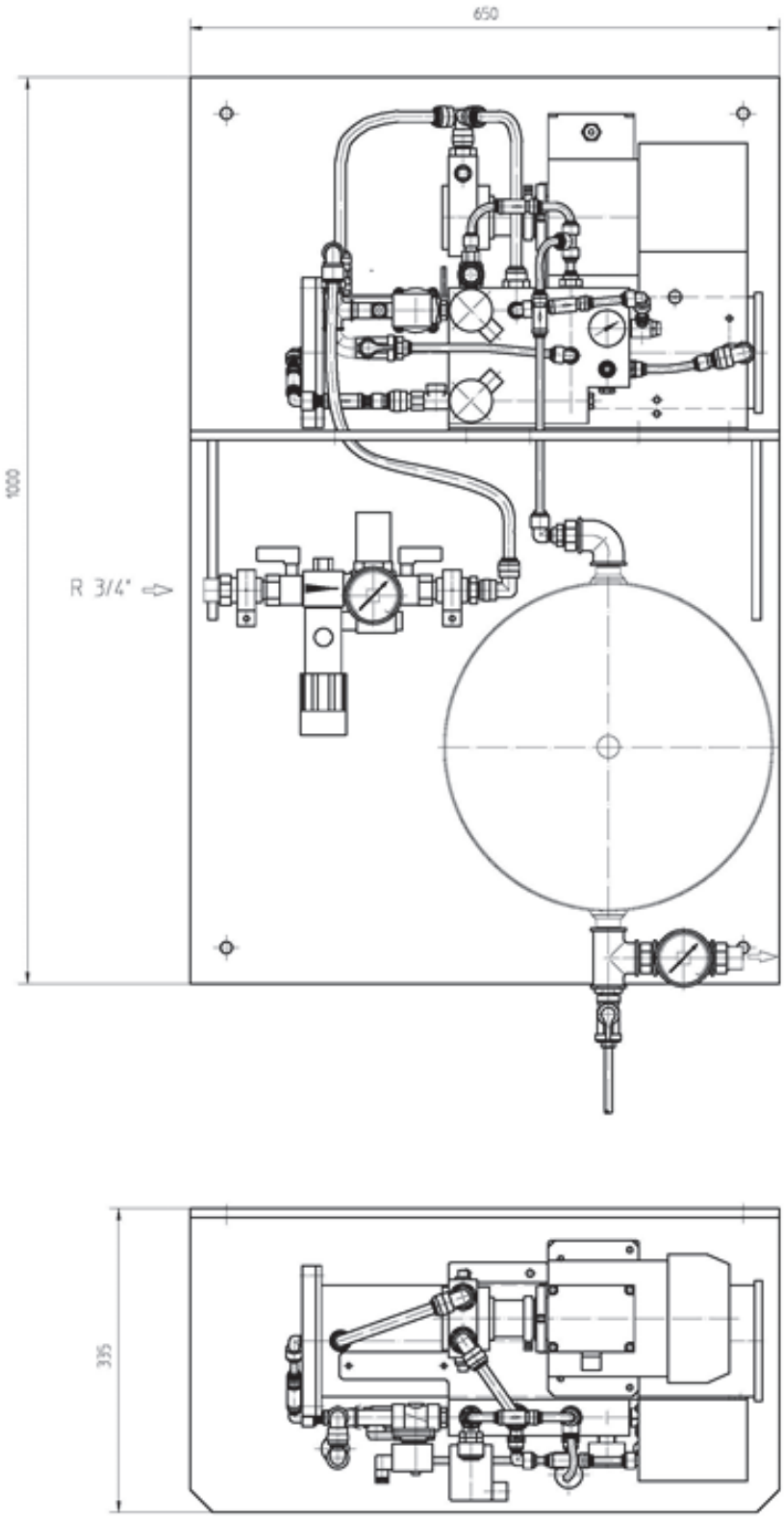


Fig. 3: Front/Top view

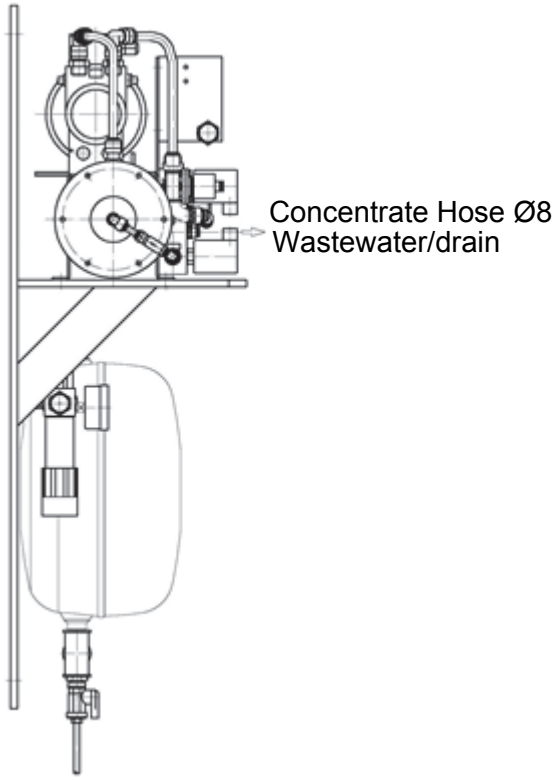


Fig. 4: Lateral view

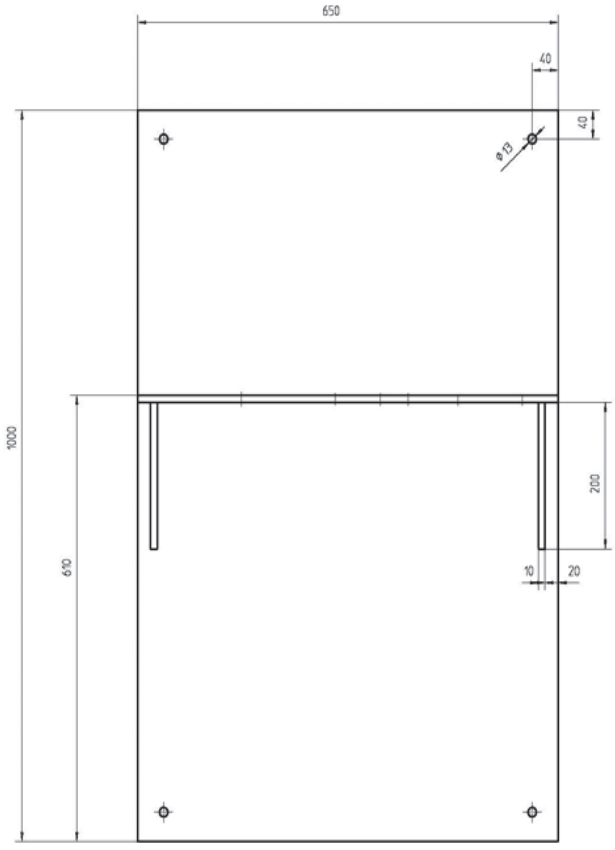


Fig. 5: Front view of securing and fixing plate

5.6 Emissions

5.6.1 Operating and auxiliary materials

WARNING!

When working on and with the system the legal responsibilities for waste prevention and proper waste recycling/disposal must be observed.

The following water pollutant substances must not get into the ground or into the waste water system:

- Lubricating greases and oils
- Hydraulic oils
- Cooling agents
- Chemicals
- Cleaning fluids containing solvents

These materials must be kept in suitable containers, transported, collected or in the case of chemicals, neutralised, and disposed of according to current regulations.

5.6.2 Noise emission from the system

In operation, the A-rated equivalent emission sound pressure levels is < 70 dB(A).

6. Mounting

6.1 Mounting the securing and fixing plate

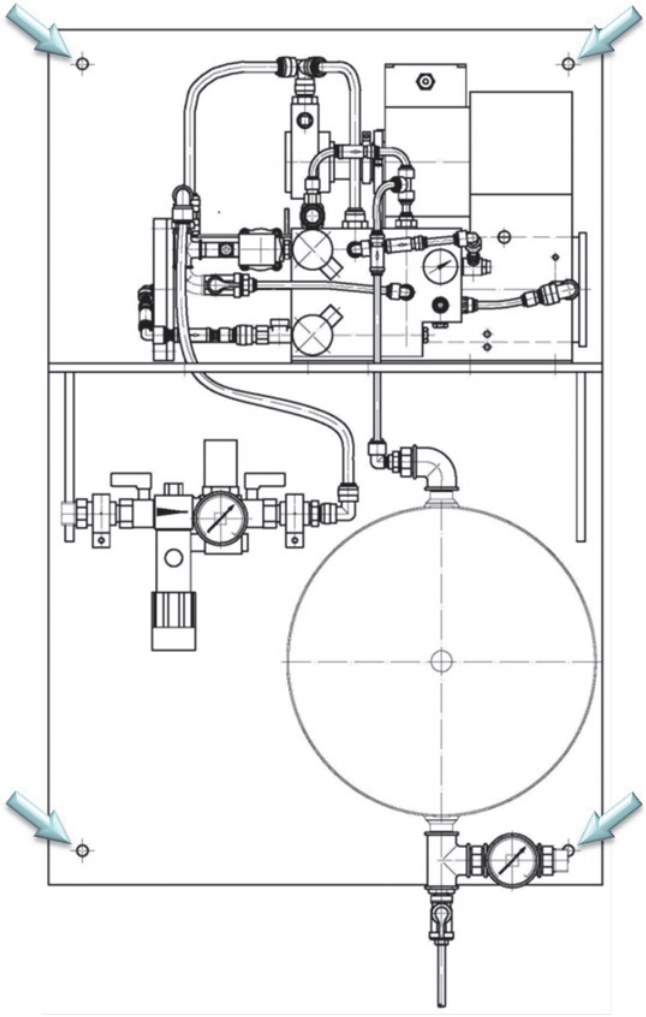


Fig. 6: Mounting the securing and fixing plate

Step	Action
1	Select a sufficiently large, even wall that is strong enough to bear weight or prepare another mounting system. For unrestricted raw water and permeate connection installation and for replacing the membran (if required), sufficient space must be available to the left, right and underneath. Changing the membran requires 50 cm minimum clearance on the left hand side. Dimensions of the securing and fixing plate: see section 5.5.
2	When mounting the device, consider the following: • the system must not be located in potentially explosive areas • the permitted operating temperature must not be exceeded. See section 3.4.
3	Fasten the securing and fixing plate using the four points provided.

6.2 Connecting the plant

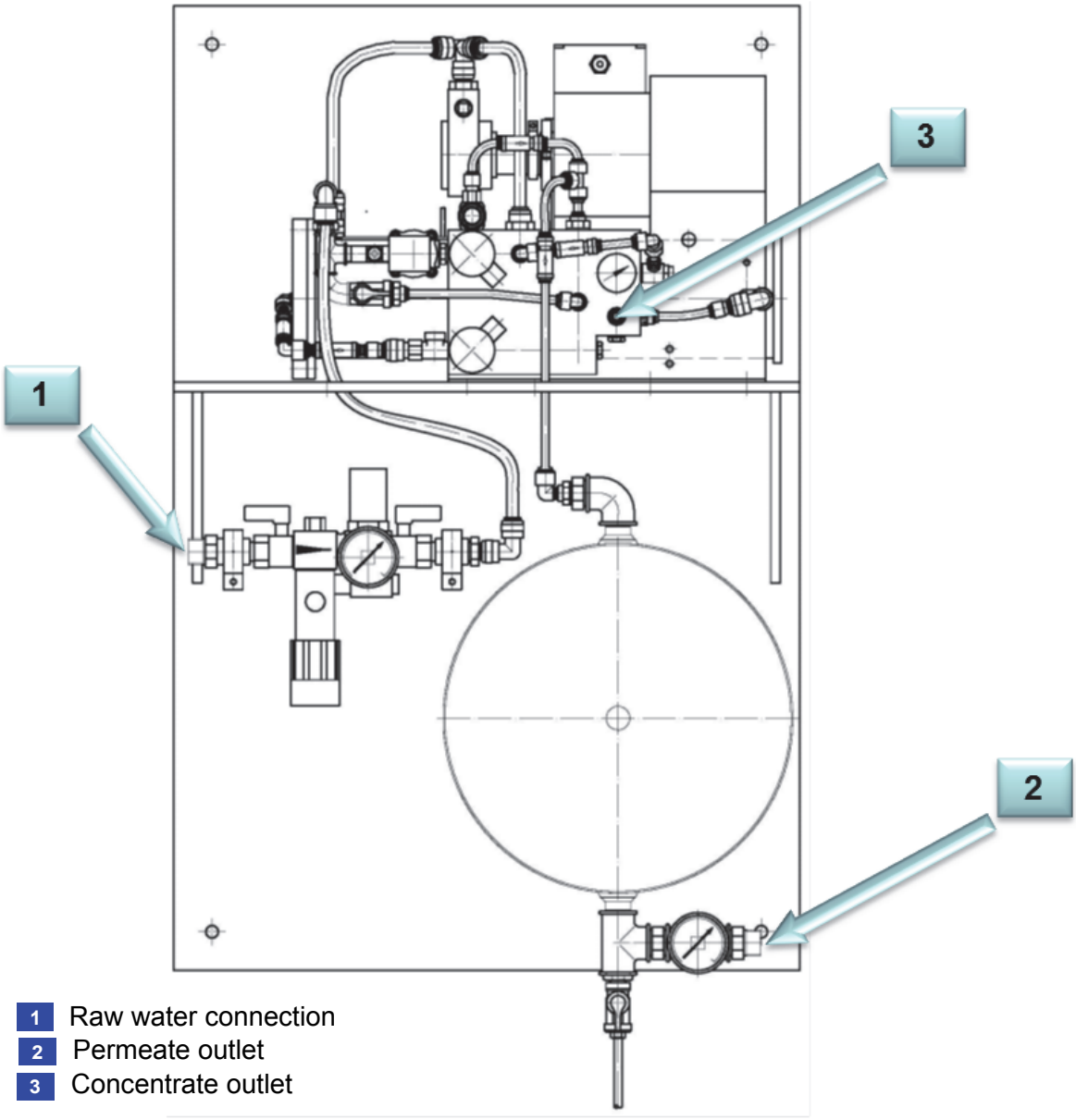


Fig. 7: Overview on connections

Fig. 8: Concentrate outlet hose with nozzle

Step	Action
1	When making connections, consider the following: • DIN 1988 • DIN EN 1717 • DIN EN 806 • Regulations of the responsible water supply company
2	Raw water supply → Raw water intake Ensure that on the intake side no fittings, armatures etc. are installed within an area of at least 20 cm. Use a hose to connect the raw water supply and the raw water intake.
3	Concentrate hose → Waste water channel Ensure free drain according to DIN EN 1717.
System preserved by manufacturer	
4a	Permeate outlet → Waste water channel channel (for rinsing the preservation solution)
4b	Permeate outlet → System to be filled
System not preserved or already rinsed out	
5	Permeatausgang → System to be filled

7. Inital start-up (System was preserved by manufacturer)

CAUTION!

Danger of material damage

The systems are factory preserved to protect the membrane from germs.

- During initial commissioning, the preservation solution must be rinsed out and the permeate produced must be directed into a waste water channel.

Before switching on the system, check and ensure that

- only authorised persons remain in the work area of the system
- there is no visible damage: check mechanical and electrical connections such as hose and screw connections and cables. The system must not be switched on before any damage detected is rectified.
- no one can be injured by starting up the system.

Step	Action
1	Ensure that the permeate outlet is **not** connected to the system to be filled. The permeate produced during initial commissioning must be directed into a waste water channel.
2	Open the shut-off ball valve on both the inlet and outlet side of the combined system separator/pressure regulator.
3	Check the network cable for damage and **insert** the **mains plug** into a power outlet. The control device runs a self-test: the green and red LEDs briefly flash yellow. The green LED flashes. The raw water inlet solenoid valve opens.

4	**Open raw water supply.** The pressure switch (permeate) turns on. The system is filled and the inlet pressure is built up. The high-pressure pump starts when the required threshold value for inlet pressure is achieved. Permeate is produced. The green LED illuminates.
5	**Rinse out** the preservation solution for at least **10 minutes**.
6	• **Pull out mains plug**. • **Close raw water supply**.
7	**Connect the permeate outlet with the system to be filled.**
8	Check the network cable for damage and **insert** the **mains plug** into a power outlet. The control device runs a self-test: the green and red LEDs briefly flash yellow. The green LED flashes. The raw water inlet solenoid valve opens.
9	**Open raw water supply.** The pressure switch (permeate) turns on. The system starts up and then begins production The green LED illuminates.

8. Settings

8.1 Setting the switch-off pressure

When the required operating pressure is achieved in the system to be filled, the system switches off automatically via the pressure switch (permeate). This pressure must be adjusted on the pressure switch (permeate). Factory setting is approx. 3 bar.

Please note

Before changing this setting pls. contact HygroMatik GmbH.

The system switches back on again automatically when the pressure in the system to be filled has dropped by approx. 0.5 bar.

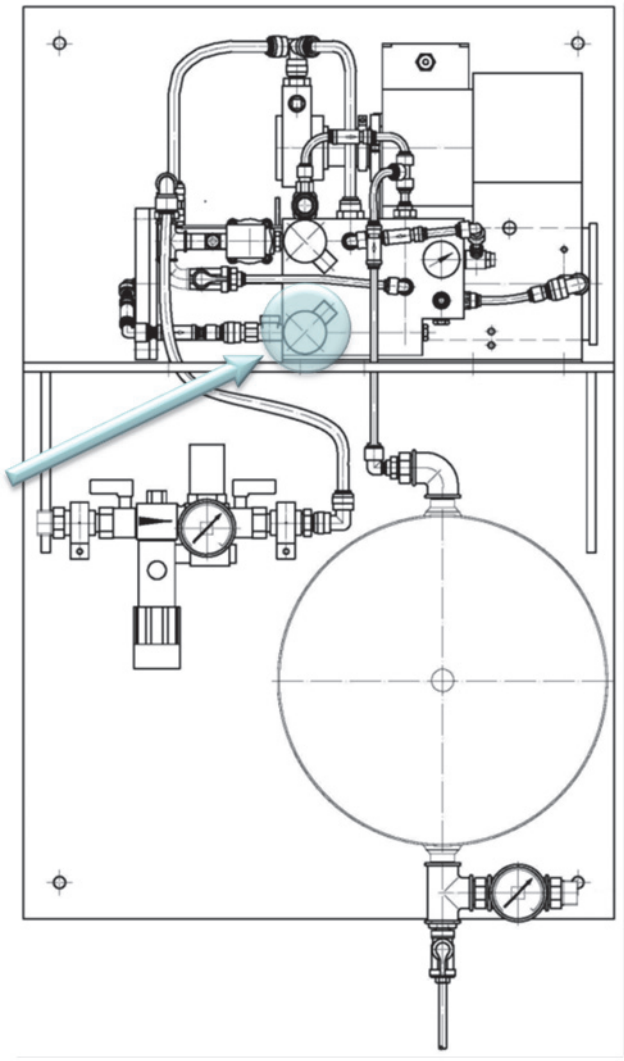


Fig. 8: Pressure switch (Permeate)

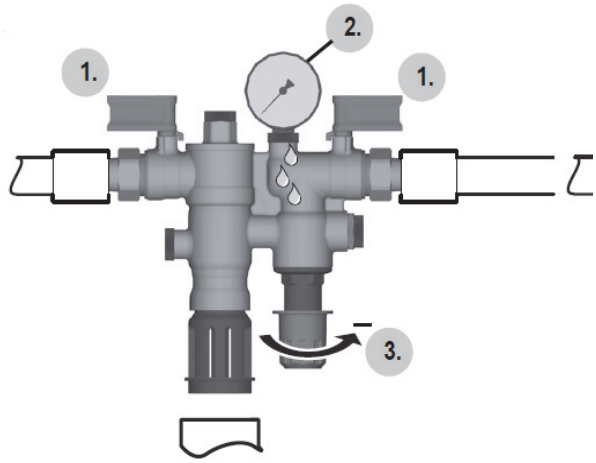
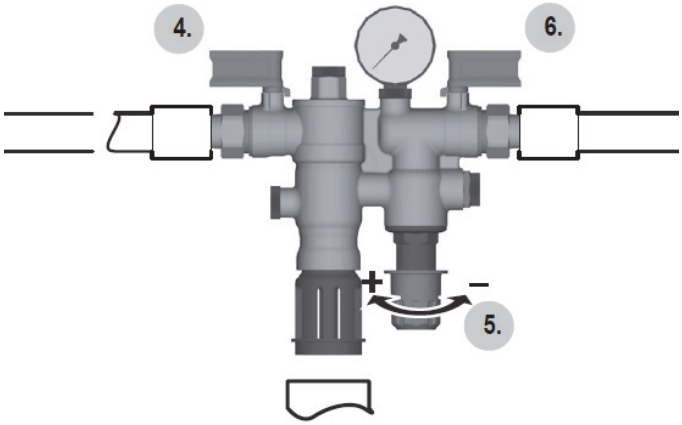
Step	Action
1	Unscrew and remove the transparent cover of the pressure switch (permeate).
2	Set the switch-off pressure with the control dial on the pressure switch (permeate). The pressure switch (permeate) has an adjustment range of 1 to 3.5 bar. The control dial is restricted by an endstop: • White control dial fully turned to the right: pressure switch set to 1 bar • White control dial fully turned to the left: pressure switch set to 3.5 bar  Fig. 9: Control dial endstop of pressure switch(Permeate) When the required pressure is achieved in the system to be filled, the system **switches off automatically** via the pressure switch (permeate). The system **switches back on again automatically** when the pressure in the system to be filled has dropped by approx. 0.5 bar.
3	Reposition the transparent cover and screw it in.

8.2 Setting raw water inlet pressure on the pressure regulator

Raw water inlet pressure must be **at least 2 bar** and must not exceed **a maximum of 6 bar**.

Factory setting of the pressure regulator is 6 bar.

In case of the permeate to be blended with raw water, raw water inlet pressure must be 1 bar beyond permeate pressure. Permeate pressure can be monitored by means of pressure gauge PI110.60.

Figure	Step	Action
	1	Close inlet and outlet shut-off ball valves.
	2	Depressurize outlet side. This may be achieved by e.g. loosening the outlet pressure gauge. Pressure gauge should then be tightened again.
	3	Release the compression spring: Turn the adjustment handle counterclockwise (-) as far as it will go.
	4	Slowly open inlet shut-off ball valve.
	5	Turn adjustment handle clockwise (+) until pressure gauge shows the pressure desired.
	6	Slowly reopen outlet shut-off ball valve.

9. Production/Stand-by operation

9.1 Starting production

Before switching on the system, check and ensure that

- only authorised persons remain in the work area of the system.
- there is no visible damage: check mechanical and electrical connections such as hose and screw connections and cables. The system must not be switched on before any damage detected has been rectified.
- no one can be injured by starting up the system.

Step	Action
1	Slowly open the shut-off ball valves on both inlet and outlet sides of the combined system separator/pressure regulator. Pressure deviations may lead to water dripping from the outlet connection.
2	Check the network cable for damage and **insert** the **mains plug** into a power outlet.
	The control device runs a self-test: the green and red LEDs briefly light up simultanously. The green LED flashes. The raw water inlet solenoid valve opens.
3	**Open raw water supply.**
	The pressure switch (permeate) turns on. The system is filled and inlet pressure is built up. The high-pressure pumps starts when the required threshold value for the inlet pressure is achieved. Permeate is produced. The green LED illuminates.

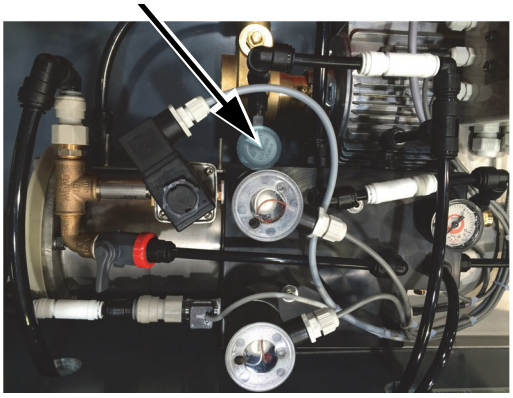
9.2 Set blending (ROB plant only)

The blending armature allows for adjusting pure water quality continously from raw water quality to permeate quality (conductivity 5 to 20 µS/cm). Blending the permeate with raw water is achieved via the blending pipe.

Auxiliary equipment required

A collecting vessel of at least 15 liter capacity is required.

Set blending

Step	Action
1	Close inlet pipe of system to be filled.
2	Open sampling valve (have collecting vessel ready).
3	Close blending armature.  Fig. 10: Location of blending armature
4	Exhaust pressure vessel: System must run for a period of time that will allow for at least 15 liter of permeate drain through the sampling valve into the collecting vessel.
5	Determine conductivity in permeate.
6	Set blending armature (a maximum of six full turns is possible).
7	Repeat step 5 and, if required, step 6
8	Close sampling valve and open inlet pipe to system to be filled.

9.3 Stand-by operation

On reaching the operational pressure required in the system to be filled, the plant automatically shuts down by means of the pressure switch (permeate) :

- the high-pressure pump stops
- the raw water inlet valve remains open in order to push-out the concentrate from the membrane
- the plant goes to stand-by mode with the raw water inlet valve close and a flashing green LED

9.4 System shut-down

Please note

The plant may only be shut-down for maintenance or for permanent closure. When in production mode, cyclic permeate consumption is mandatory in order for the system not to be prone to microbial contamination.

When used with active HygroMatik products, permeate consumption is guarantied within a 24 hour time frame minimum.

For switching off the system simply pull out the mains plug from the power socket.

10. Diagnostics

The system state is communicated via two LED signal lamps on the control device:

- Operating display
- Fault indication display

Fig. 12: LED signalling lamps on control device

10.1 System state

	LED state	Significance	Possible cause Troubleshooting
Green LED	flashes slowly ✓- - - - -	**Idling** System is in stand-by mode no demand for permeate	-
	permanently lit ✓——	**Operational** Permeate is produced Solenoid valve in raw water pipe is open High-pressure pump is operational	-

	LED state	Meaning	Possible cause Troubleshooting
Red LED	flashes fast 	**Fault** **Inlet pressure too low** If the minimum required admission pressure of 0.7 bar is not reached, the system switches off (dry-run protection for the high-pressure pump).	**Possible fault cause** • insufficient inlet pressure **Tests/measures for troubleshooting** • Check pressure in public water mains: are similarly sized raw water recipients in operation, which are influencing the pressure? • Is the raw water supply pipe fully opened?
	flashes slowly 	**Fault** **Requested permeate amount too low** If the minimum requested permeate amount is not reached, the system shuts down.	**Possible fault cause** • Concentrate return improperly set • Motor of high-pressure pump defective • Permeability of membrane too low **Tests/measures for troubleshooting** • Does the high-pressure pump start? • Does concentrate flow? Watch concentrate hose in waste water drain • Does permeate flow? Watch water meter • Replace membrane • Adjust concentrate return: increase pressure with VL110.18 (see section 4.3)
	permanently lit 	**Fault** **Permeate conductivity too high** On reaching the maximum premissable conductivity of the permeate the system shuts down. **Please note**: In case of blending with raw water, the conductivity measurement does reflect pure water quality. Alarm threshold: **100** µS/cm	**Possible fault cause** • Raw water quality has changed • Membrane defective (desalination effect of membrane too low) **Tests/measures for troubleshooting** • Check water quality • Replace membrane

	LED state	Meaning	Possible cause troubleshooting
Green and red LED	off	**Fault control device**	**Possible fault cause** • Control device defective **Tests/measures for troubles-hooting** • Is the mains plug inserted in a power socket? • Is the power socket functio-nal?
	illuminate briefly and simultanously	**Self-test** The system runs a self-test and then enters stand-by mode or starts production.	

10.2 Rest fault indication

Step	Action	Result
1	Pull power plug.	-
2	Check power cable for damage and re-insert power plug into a po-wer socket.	The control device runs a self-test: The green and red LEDs briefly flash yellow. Following this, the sy-stem enters stand-by mode or starts production.

10.3 Involve HygroMatik service personnel

In case of not succeeding in finding the problem cause, or if troubleshooting has not resolved the problem, please call Hygro-Matik GmbH.

11. Maintenance

Please note

It is recommended that the system is inspected and serviced at least once per year by HygroMatik service personnel or a HygroMatik service partner.

Prior to maintenance

Prior to any maintenance work, pls. follow the following instructions:

- Depressurise the system
- Pull power plug and secure system against being restarted
- Ensure that all system parts have cooled down to room temperature.

After maintenance

When maintenance is complete and prior to starting production, pls. observe the following instruchtions:

- All materials, tools and other equipment required to carry out maintenance or servicing work must be removed from the system's work area.l
- Check that any loosened screw connections sit firmly
- Ensure that all removed parts (e.g., the red groove ring, …) have been reinstalled.
- Ensure that any spilt liquids have been removed.

11.1 Replacing the membrane

Interval

Replace the membrane if one of the two following faults is indicated by the signalling lamps: "Permeate amount too low" or "Conductivity in permeate too high".

WARNING!

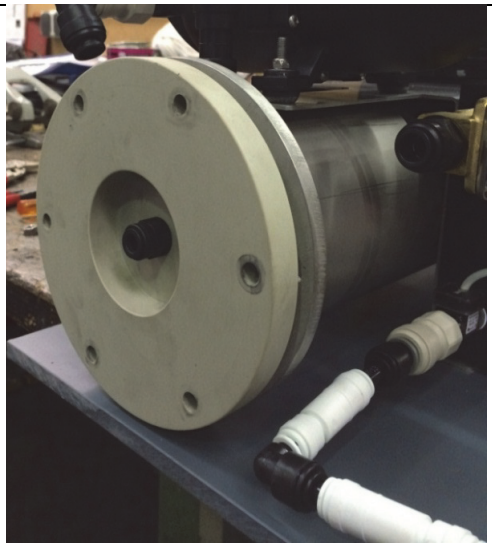
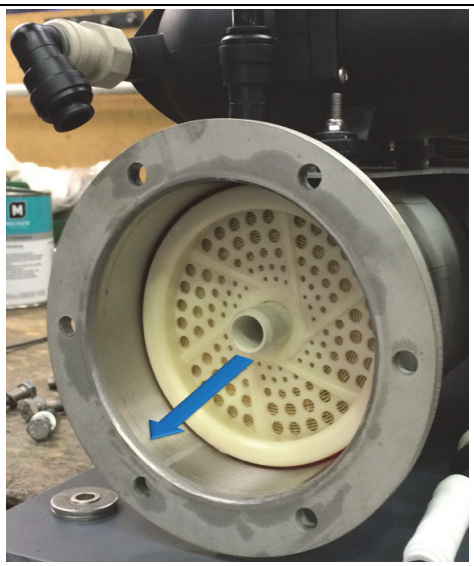
Risk of microbial contamination!

Be sure to wear disposable gloves when changing the membrane.

Isolating the system

Step	Action
1	Pull power plug.
2	Cut-off raw water supply.
3	Depressurise reverse osmosis system by opening sample valve in permeate pipe line.

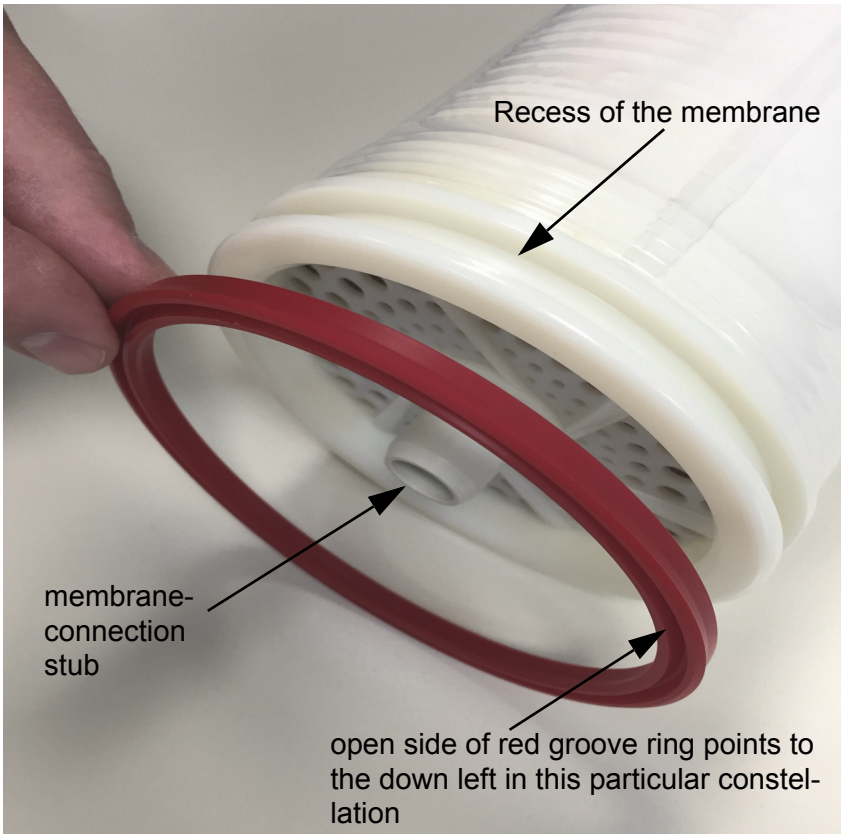
Pulling out the membrane

Step	Action	
1	**Disconnect** the **pipeline** attached to the cover of the pressure pipe (permeate outlet). Pull back the ring on the bushing and remove pipe line from bushing.	
2	**Unscrew and pull off the cap from the pressure pipe**. The cap sits very tightly in the pressure pipe and a suitable tool must be used to pull it off.	
3	**Pull out the membrane**. The membrane sits very tightly in the pressure pipe and a suitable tool must be used to pull it off.	

Inserting the membrane

Please note

The black groove ring that comes with the membrane ist not to be used and must be discarded!

Step	Action
1	Slide red groove ring onto new membrane (make sure that the above note is observed!) 
2	Check the position and fit of the "Concentrate ring": this ring is a sort of spacer, that is located vertically on the other end in the pressure pipe.
3	Slide membrane slowly and carefully into the pressure pipe.
4	Reattach cap to pressure pipe and hand tighten screws.
5	Reconnect pipelines.
6	Restart the plant and check for the following: • Leakage • Quality of permeate (conductivity) – no conductivity fault indication is permissable* • Permeate volume flow – no volume flow fault indication is permissable* * See chapter 10.

11.2 System separator: Maintaining and cleaning the cartridge

CAUTION!

Danger of material damage

The plastic parts in the cartridge may be damaged by the use of cleaning agents containing solvents and alcohol. Damaged plastic parts may result in leakage or functional errors.

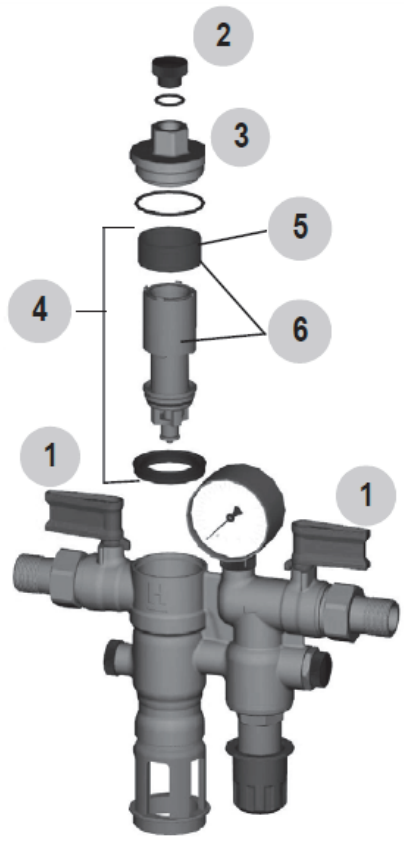
Do not involve agents containing solvents or alcohol when cleaning the plastic parts.

WARNUNG!

Danger of environmental damage

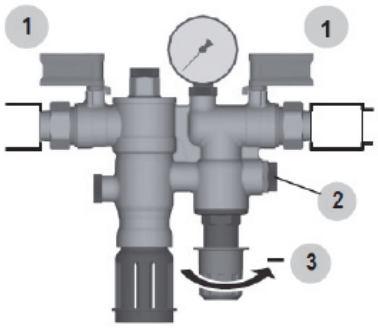
Cleaning aids can cause water contamination.

Cleaning aids must not be release to the environment or into the sewerage.



1 (1 in fig.)	Close ball cocks on inlet and outlet sides.
2 (2 in fig.)	Depressurise system separator by unscrewing sealing plug.
3 (3 in fig.)	Unscrew cover, remove seal.
4 (4 in fig.)	Pull the cartridge and dirt trap out of the housing.
5 (5 in fig.)	Detach dirt trap from cartridge.
6 (6 in fig.)	• Do not dissassemble cartride but clean as a whole instead • Clean dirt trap as well • Replace dirt trap and cartridge if required
7	Reassemble dirt trap and cartridge.
8	Reinsert the cartridge into the housing, until engagement is achieved.
9	Reinsert seal and screw cover back on.
10	Screw sealing plug back in and hand tighten.
11	Check function (see section 11.5).

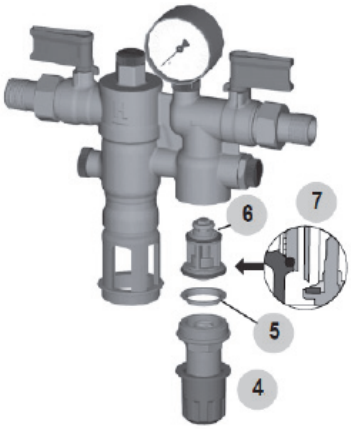
11.3 Pressure regulator: inspect valve insert and strainer

Figure	Step	Action
	1 (1 in fig.)	Close ball cocks on inlet and outlet sides.
	2 (2 in fig.)	Depressurise pressure regulator: Unscrew sealing plug and screw in again hand tight.
	3 (3 in fig.)	Release compression spring: Turn adjustment handle counterclockwise (-) as far as it will go.

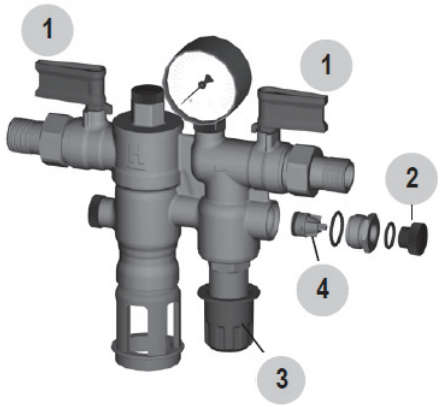
CAUTION!

Risk of injury due to compression spring jumping out.

Ensure that the compression spring is released.

Figure	Step	Action
	4 (4 in fig.)	Unscrew spring cover with suitable wrench.
	5 (5 in fig.)	Remove sliding ring.
	6 (6 in fig.)	Pull out the valve insert off the housing with the help of pliers.
	7 (7 in fig.)	• Check sealing disc, nozzle and groove ring for proper condition • Replace valve insert, if required
	8	• Push back valve insert into the housing • reattach sliding ring • Screw on spring cover
	9	Adjust pressure: see section 11.5.

11.4 Pressure regulator: replace backflow preventer

Figure	Step	Action
	1 (1 in fig.)	Close ball cocks on inlet and outlet sides.
	2 (2 in fig.)	Depressurise system separator: Unscrew sealing plug.
	3 (3 in fig.)	Remove valve insert according to section 11.3.
	4 (4 in fig.)	• Unscrew cover • Remove seal • Pull out backflow preventer and replace • Reinsert seal and screw on cover • Screw on sealing plug and handtighten
	5	Reattach valve insert according to section 11.3.
	6	Check function: see section 11.5. .

11.5 Pressure regulator functional check

Step	Action
1	Close ball valve on outlet side.
2	Check pressure on outlet pressure gauge during zero flow: In case of the outlet pressure slowly rising, either the valve seat or the valve disc within the pressure regulator may be contaminated or defective. Check valve insert and strainer in pressure regulator.
3	Slowly open outlet ball valve.

11.6 Drain valve functional check

Step	Action
1	Lower inlet pressure: if drain valve opens (i.e. water drips out) the drain valve functions properly.

11.7 Functional checks with pressure check equipment.

Functional checks for the drain valve and **the outlet backflow preventer** must be carried out with special testing equipment. For this purpose, contact an installation company.

12. Placing out of operation and preservation

When the time of nonuse exceeds two days, the system must be preserved.

Preparation

Step	Action
1	Pull mains plug.
2	Cut raw water supply and disconnect raw water hose with system separator.
3	Disconnect permeate hose from heating system; guide hose to waste water drain; ensure unit can drain freely according to DIN EN 1717.
4	Unscrew cover from filter housing and remove filtering candle.
5	Continue with „Prepare preservative agent“.

Prepare preservative agent

DANGER!

Personal injury hazard caused by sodium disulfite handling

Sodium disulfite

- is harmful to health when swallowed
- may cause heavy eye injury
- develops toxic gases when in contact with acids

For this reason, when handling sodium disulfite,

- read and obey all security instructions according to the Security data sheet and those attached to the transportation box cover
- Wear personal protective equipment

1	Fill **0.5 Liter of clean water** in a vessel of at least 1 Liter capacity, use of permeate is best.
2	Open chemical product package and pour 5 grams of **sodium disulfite** in vessel (corresponds to approximately one level teaspoon). A concentration of 1% will result. Ensure that the chemical product has fully dissolved and homogenised.
3	Close chemical product package carfully.

Preserve system

CAUTION!

Material damage risk

Preservation is used for protection of the membrane against microbiological contamination. No later than 3 months after a preservation, the system must be taken into operation (see hint with respect to rinsing in chapter 7, „Initial start-up“) or must be preserved again.

PLEASE NOTE

For the next steps, do not remove the Personal protective equipment (gloves, protective glasses) used when preparing the preservation agent.

1	Cover the transportation box interior with rugs or similar material and protect the system parts within the fine filter surrounding, since the preservation dilution may spill over.
2	Pour preservation dilution into filter housing cover.
3	Remount filter housing cover.
4	Connect raw water supply hose with system separator to raw water supply.
5	Check mains cable for damage and insert mains plug into socket. The green LED flashes.
6	Open raw water supply. The pressure switch (permeate) is activated. The systems starts up and production commences. The green LED is lit.
7	• Venting: Push red button on fine filter very shortly until water exits • Rinse-in preservation dilution for a period of 20 secs
8	• Pull mains plug • Cut raw water supply and disconnect • Disconnect concentrate hose
9	Let hoses run empty. Disconnect hoses from transportation box connections and stow away within transportation box.
10	Mark system clearly as „Preserved“.

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13. Spare parts

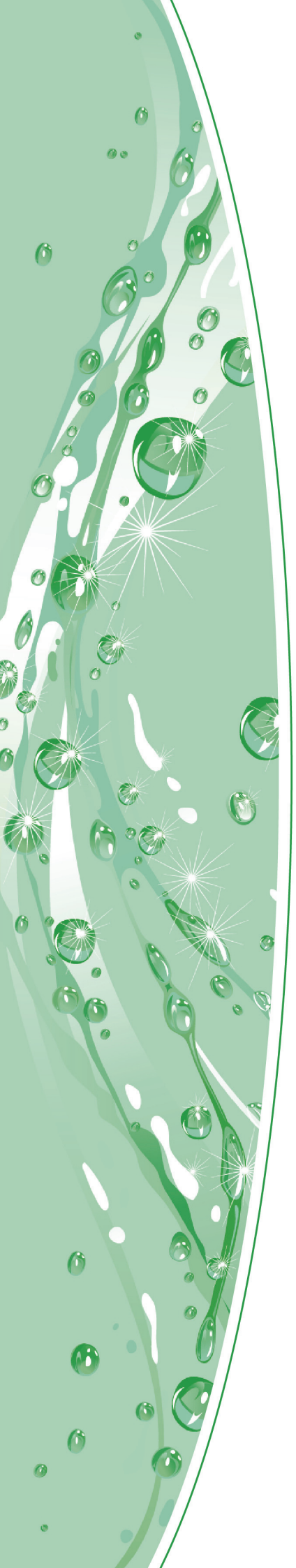
Genuine spare parts

HygroMatik GmbH recommends the use of genuine spare parts. This is the only way to guarantee the safe and proper operation of the system and to ensure that the warranty conditions are met.

Spare parts ordering

For ordering spare parts, pls. contact Airtrend Limited.

WL-RO-170	WL-ROB-170	Article No.	Description
x	x	E-5004012	Rotary vane pump 1000l/h without motor
x	x	E-5004014	Motor 0,55 kW, 230V, 50Hz
x	x	E-5004016	Central processor unit for reverse osmosis unit
x	x	E-5004018	Solenoid valve 2/2 way G 3/8", 20 bar
x	x	E-5004020	Pressure switch 1 - 3 bar, 1/4"
x	x	E-5004022	Volume flow sensor 1 - 25 l/min
x	x	E-5004024	Non-return valve 5/16", PN10
	x	E-5004026	Control valve with terminal conn. 8 mm, 1/4" BSP, PN10
x	x	E-5004028	Ball valve DN 6, AG 3/8", IG 1/4"
x	x	E-5004030	Sensor for water conductivity 1/4"
x	x	E-5004032	Membrane low-energy
x	x	E-5004034	Lip seal for Membrane 119 x 106 x 6,5 mm
x	x	E-5004036	System separator BA R 3/4"
x	x	E-5004038	Membrane pressure tank
x	x	E-5004040	Sampling tap in permeate pipe AG3/8" -IG1/4"
x	x	E-5004042	Pressure gauge 0 - 6 bar 1/4"
	x	E-5004044	Adjusting valve for blending device with handwheel
When you ordering spare parts, please specify type of unit and serial number.			



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