



**BWT PERMAQ<sup>®</sup>**  
**PRO 1810-1820**  
**Reverse Osmosis Plant**



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## 1. GENERAL INFORMATION

This installation and operating manual applies to BWT PERMAQ® Pro 1800 total desalination plant.

This installation and operating manual contains important information about the correct installation and operation of the BWT Pro 1800 plant.

1. Enclosed "Start-up test"- (section 13.4) shall be completed and filed together with the operating journal.
2. Operating journal shall be updated as described in "Operating journal" (section 13.5).
3. Floor drain must be available in the immediate vicinity of the plant.
4. The BWT PERMAQ® Pro 1800 plant removes more than 99 % of all salts, and that is why you need to be alert to possible post-treatment with mixed bed or similar, if a better water quality is requested.
5. The authorised agent takes on full responsibility without costs for BWT who, however, grants a 12 months guarantee inclusive of replacement of defective spare parts, on condition that the parts are returned to BWT along with a specification of the fault and stating production month/year (plant no.).
6. The warranty becomes invalid, if the plant is not commissioned by an authorised BWT service technician.

7. The warranty becomes invalid, if maintenance intervals are not met.

Your BWT PERMAQ® Pro 1800 plant is constructed in a compact design with reservoir (option) and softening unit (option) installed externally so that the plant takes up as little space as possible and can be installed in the most suitable way.

This instruction should be read carefully before installing and starting up the plant. Correct installation and operation will also form the basis of a factory warranty.

The BWT PERMAQ® Pro 1800 plant with its compact and finished design is easy to install, since all installations are pre-assembled and tested in our factory.

Your BWT PERMAQ® Pro 1800 plant is designed for a minimum of service and for long and unproblematic operation. However, this is on condition of correct installation and maintenance.

Always read this manual carefully before commissioning.

## 2. EXPLANATION OF WORDS

There will be a few technical explanations in this instruction which we explain below.

*Permeate:* The treated, totally desalinated water which is produced by the BWT PERMAQ® Pro 1800 plant and supplied to the reservoir tank.

*Concentrate:* Is the water that is led to outlet. This water contains the

salts and minerals that have been removed from the water.

*Feed water:* Is the water which is led directly to the BWT PERMAQ® Pro 1800 plant and which must be desalinated in the BWT PERMAQ® Pro 1800 plant.

*TDS:* The amount of totally dissolved salts, measured in (mg/l).

*Conductivity:* Is the designation of salt concentration of the water, measured in (µS/cm). The lower the value, the better the water quality.

*Membranes:* Is the filter of the plant which by high pressure and flow is capable of desalinating the feed water.

*RO:* The abbreviation for Reverse Osmosis.

*Transport-pump:* Is the pump which transports the treated water from the plant reservoir to the consumer.

*Level switch:* Is a switch, which gives a signal when the BWT PERMAQ® Pro 1800 plant must either be started or stopped, and it stops the transport pump in case of dry-running of the reservoir tank.

*Softening plant:* Is a pre-filter which softens the water, that means it removes hardness from the water.

### 3. POSITIONING OF THE PLANT

The plant must be placed in a non-freezing environment on a level foundation, so that the water in the reservoir tank (option) does not overflow when the tank is full.

The foundation must be able to tolerate a weight load of 70 kg in total which is the approximate weight of the BWT PERMAQ® Pro in operation. However, remember to take into account the weight of the softening unit and the reservoir tank! The outside measures of the BWT PERMAQ® Pro are WxDxH: 650 x 550 x 1600 mm, but when positioning the plant you must take into account that a softening unit (option) and possibly a reservoir tank (option) have to be installed too.

You have to allow for 1000 mm extra height in order to be able to take out the plant membranes.

Also, there has to be made room on the left side of the plant for the water installation, especially the outlet hose from the plant must be considered: The hose may never be bent!

Positioning of plant must be in such a way that the air intake at the top of the pump never becomes covered.

Furthermore, there are readings that have to be performed on the front of the plant, e.g. flow meter and possible alarm in case of lacking water pressure. Consequently the front must not be covered up, but should always be visible.

In case of a stoppage, situations may arise where the level in the reservoir (option) overflows. Therefore, there shall always be a drain in close proximity of the plant, placed in such a way that the overflowing water does not cause any damage.

If there is no floor drain near

the plant, installing the plant is at your own risk.

### 4. WATER QUALITY

The feed water, which is to be treated in the BWT PERMAQ® Pro 1800 plant, must be softened drinking water quality with maximum 500 mg/l TDS. Max. temperature: 35 °C. The plant is adjusted at 10 °C in our factory.

The feed water may maximum contain:

- \* Hardness: 0.5 °dH (obtainable by installation a softening unit (option))
- \* Fe: 0.05 mg/l
- \* Mn: 0.02 mg/l
- \* Cl: 0.1 mg/l
- \* Turbidity: 1.0 NTU
- \* SDI: 3.0 %/min
- \* KMnO4 max: 10 mg/l

If there are doubts about the raw water composition, a water analysis must be made. The plant must be connected to a water pressure of minimum 3 bar and maximum 7 bar. The quality of the treated water will

Water quality (contact BWT for technical advice)		
Content	Symptom	Preventive action
TOC, BOC and COD	Can cause slimy as well as firm hard film.	Can in some cases be micro-filtrated or removed by means of a carbon filter.
Iron, Manganese (ocher)	Precipitation of iron gives a reddish-brown film and precipitation of manganese gives a black deposit.	Sand filter – oxidation, softening, greensand.
Calcium, magnesium (hard water)	The membrane scales.	Softening, antiscalant.
Silica	The membrane scales.	Antiscalant.
SDI (silt)	The membranes gets clogged.	Microfiltration (absolute), ultrafiltration, flocculation.
Oil	The membrane is greasy from oil.	Carbon filter.
Particles	The membrane gets clogged due to hard deposits.	Microfiltration.
Chlorine, pesticides, organic solvents	Membrane deformed. Permeate capacity and quality changed and cannot be CIP-cleaned back to the original capacity. The deformation is not visible.	Free chlorine shall be removed by active carbon filter and chemical cleaning, either with Thiosulphate or sulphite.
Bacteria	Membrane is clogged by slime.	Chlorination + de-chlorination, UV, micro-filtration 0.2 µS/cm and ultra-filtration.

be less than 20  $\mu\text{S}/\text{cm}$  at 10 °C.

## 5. WATER CONNECTIONS

Note! All water connections must be in compliance with local regulations.

For connection of raw water to the softening unit, see the enclosed guide on the softening unit.

### 5.1 Connection of soft water to the BWT PERMAQ® Pro

Connect soft water to the connection on the left side of the plant on the backside (see encl. 13.2). We recommend connection with  $\frac{3}{4}$ " flexible pressure hoses. BWT stock complete assembly kits for the BWT PERMAQ® Pro 1800 series.

The best operating result is obtained by connection to minimum  $\frac{3}{4}$ " feed water pipe. In this way you obtain the necessary pressure and flow to the plant.

In case of a too small feed water connection, there will be a risk of outage on the plant due to lacking water pressure/amount, e.g. during flushing of membranes, when the plant is started up, and a bad function of the softening plant.

### 5.2 Connection of permeate hose

The permeate hose (14 mm), which is enclosed with the plant, shall be fitted on the external reservoir (option) and be led on to the flow meter of the BWT PERMAQ® Pro (outlet top).

### 5.3 Connection of permeate (desalinated water for consumption)

Connect desalinated water (water for consumption) to the water connection on the reservoir

pump (option) – the reservoir pump is recommended connected with  $\frac{3}{4}$ " flexible pressure hoses, (see encl. 13.2).

Important! Totally desalinated water can accelerate corrosion, consequently you should always use corrosion proof piping for the treated water, e.g. stainless steel or PVC pipe.

### 5.4 Connection of outlet hose (concentrate)

The outlet valve (concentrate) shall be fitted with a 14 mm hose (enclosed). The hose shall be led to floor drain. (If a bent piece of hose has been fitted on the outlet valve, this shall be removed first).

Important! The outlet pipe must not be led all the way down into the water in the floor drain, as there is then a risk it will get sucked back into the plant in case of a stoppage.

Important! It should never be possible for the outlet hose to become bent or in any other way clogged, as it would damage the membrane(s).

## 6. ELECTRICAL CONNECTIONS

Note! The electrical connections must be made in compliance with local regulations.

The electrical connection to the BWT PERMAQ® Pro 1800 plant must be as follows:

\*Voltage: 3x400 V+N+PE

\*Net: TN-S

\*Frequency: 50 Hz

\*Fuse: 16 Amp

See also electric diagram under encl. 13.3

## 7. START-UP OF THE PLANT

Read section below carefully before starting up the plant.

When the plant is started for the first time, the attached Start-up test (see Section 13.4) must be filled and archived together with Operating Journal (see Section 13.5).

- Check before start-up that all water and electric connections are made as described in previous chapters and in compliance with local regulations.
- Before start-up the softening plant (option) shall be adjusted at the current hardness in the feed water supply and then commissioned. This is done by following the softening plant instruction manual.
- Assuming that the softening plant is now in operation, check that it supplies soft water at the soft-water control valve (V3). Sampling set is included in deliveries of new softening plants (see instruction manual in the box).
- Pull out the permeate hose from the reservoir tank (option) and lead it away from the reservoir to a drain. (This does not apply to plants with quality flush (option)).
- Open the outlet valve completely (see encl. 13.7 Pos. 6).
- Now switch on the plant power supply. The plant will now be operating.
- Check that the motor runs in the right direction.
- Now the plant must operate and flush to drain for 20-30 minutes before re-adjusting the outlet valve.
- After completed flushing, adjust the outlet valve (see encl. 13.7 Pos. 6 and recirculation valve 13.7 Pos. 1).

7.1 Adjustment of outlet amount

Important! Read the entire chapter before adjustment is started.

The outlet amount must be adjusted and which amount is suitable on your plant depends on the feed-water quality. Too high water recovery will damage the plant membranes. On condition that the raw water complies with the water quality requirements, it can operate at a recovery rate of 70-80% with softening depending on the amount of organic material in the water.

BWT PERMAQ® Pro	Permeate capacity (l/h)	Outlet amount (l/h) (with softened water)		
		Surface water (70% recovery)	Surface water (75% recovery)	Groundwater (80% recovery)
1810	500	215	167	125
1820	1000	429	333	250

An easy way to check the outlet amount from the plant, is:

$$\text{Outlet amount (l/h)} = \frac{100 \times \text{Permeate capacity (l/h)}}{\text{Recovery(\%)}}$$

– Permeate capacity (l/h)

Ex.: BWT PERMAQ® Pro 1820 with 80 % recovery:

$$\text{Outlet amount} = \frac{100 \times 1000}{80} - 1000 = 250 \text{ (l/h)}$$

When the desired amount of outlet water has been obtained, tighten the counter nuts on the outlet valve so that it is locked. It is important that the outlet amount is checked after counter nuts have been tightened to make sure that the valve has not moved. Both counter nuts must be locked/tightened.

Important! The needle valve must be locked on the prescribed outlet amounts. If the needle valve is closed so that the outlet amount becomes reduced, it will damage the plant membranes.

7.2 Adjustment of recirculation amount

Adjust the recirculation amount by loosening the counter nuts on the recirculation valve. Adjust the amount of permeate at maximum 500 and 1000 l/h for the BWT PERMAQ® Pro 1810 and 1820 respectively, at a temperature between 10-35 °C.

If the temperature is below 10 °C, the capacity must be 3% lower than normal capacity for each degree below 10 °C.

E.g. if the feed water temperature is 8 °C, for an BWT PERMAQ® Pro 1810 it means that the permeate capacity will be 6 % below the normal 500 l/h, i.e. 468 l/h.

When the requested pressure and permeate capacities have been obtained, check again if the outlet amount has been adjusted correctly. (It is recommended to loosen both counter nuts while fine-adjusting the valves).

When both valves have been adjusted, lock both valves with the counter nuts. Take care not to move the valves when tightening the counter nuts.

Important! Both counter nuts must be locked/tightened on the valves.

NB! After the valves have been locked, the plant must be started and stopped 2 times, and then the flow shall be checked again – the valves can then be readjusted if necessary.

Check on the high-pressure manometer that it shows the correct operating pressure.

BWT PERMAQ® Pro	1810	1820
Pressure after the high pressure pump (bar)*	13	13
Flow after the high pressure pump (l/h)	1667	2333
Flow permeate (l/h)	500	1000
Flow concentrate (l/h)	167	333
Flow recirculation (l/h)	1000	1000

Please note that the operating pressure may vary by different temperatures and capacities.

Now check the quality of the treated water on the permeate hose; the conductivity must be below 20 µS/cm (conductivity meter is available as optional equipment).

Check that the BWT PERMAQ® Pro automatically starts and produces treated water.

You can check this on the flow meter of the BWT PERMAQ® Pro.

Check if the BWT PERMAQ® Pro automatically shuts down by too low feed water pressure or lacking feed water supply.

This is done by slowly closing the feed water supply while the BWT PERMAQ® Pro is in operation. When the water supply has been interrupted, the BWT PERMAQ® Pro shall stop automatically within 15 sec.

In order to put the BWT PERMAQ® Pro back into operation, the water supply must be re-established and the power supply disconnected and then reconnected. The BWT PERMAQ® Pro will automatically be in normal operation again!. The plant is now commissioned and ready for use.

## 8. AUTOMATIC FUNCTIONS

The BWT PERMAQ® Pro 1800 plant is equipped with a control box which has following built-in control functions:

- Level switch (option) for start/stop of high-pressure pump
- Indication of low water level and stop of transport pump (option)
- Solenoid valve controls feed water inlet
- Pressure switch for start/stop transport pump (option)
- Alarm will go off when feed water pressure drops below 0.5 bar for more than 2 min
- Stop of pump is delayed by 20/30 seconds.
- Extra level switch, Alarm High level (Option).
- Alarm conditions and DIP-switch - see section 9.2.10 and 9.2.11.

## 9. MAINTENANCE AND TROUBLE-SHOOTING

(See also encl. "13.5 Operating journal").

### 9.1 Maintenance:

The BWT PERMAQ® Pro is produced and designed for a minimum of maintenance and service. However there are some functions which should be checked regularly, therefore it is important to comply with maintenance intervals.

Maintenance intervals are compiled by updating BWT PERMAQ® Pro's operating journal "13.5 Operating journal".

### Daily:

- Capacity permeate FI1
- Conductivity (option) QIS 1
- Pressure after the high-pressure pump PI1
- Feed water pressure
- Feed water temperature
- Draw daily feed water samples (applies only if a softening unit is installed ahead of the BWT PERMAQ® Pro). If the water hardness after a softening plant is above than 0.5 °dH check the salt tank and refill if necessary.

### Every week:

- Flushing of the membranes must be done at least once a week. Open valve V3 completely for half an hour while the plant is operating. Then adjust valve V3, so that the concentrate flow becomes 20-25% again, see chapters 7.1 and 7.2

### Biannually:

- Check of pump. Follow the manufacturer's instructions.
- Check pipelines and connectors for leaks.
- Check all pressure switches, i.e. function and settings.

Note! If the plant needs to be taken out of operation for a long time, or there is a risk it might be exposed to frost, each membrane element must be preserved.

How long the plant can be out of operation before the membranes need to be preserved, depends on the intensity of the organic growth. By surface water the membranes must be preserved at a standstill lasting 3 days or longer, and by ground water the membranes must be preserved at a standstill lasting 7 days or longer.

For preservation, fill the membranes with a following solution:

Mix proportion	Preservation [%]	Frost protection [%]
Mono Propylene Glycole	-	20.0
Sodium-bisulphite	1.0	1.0

For longer-lasting preservation be aware of organic growth. When frost-protecting you also need to be aware that the pH-value should never drop below pH 3. In that case there will be a risk that the bisulfite oxidises into sulphuric acid.

If the plant operating conditions and/or capacity change compared to the start-up day, the plant must be checked in preparation for a possible cleaning of the membranes and/or adjustment of the plant capacity.

### Following must be checked regularly:

- If the capacity has dropped by more than 10%
- If the pressure after the high-pressure pump has increased
- If the conductivity has increased (option)

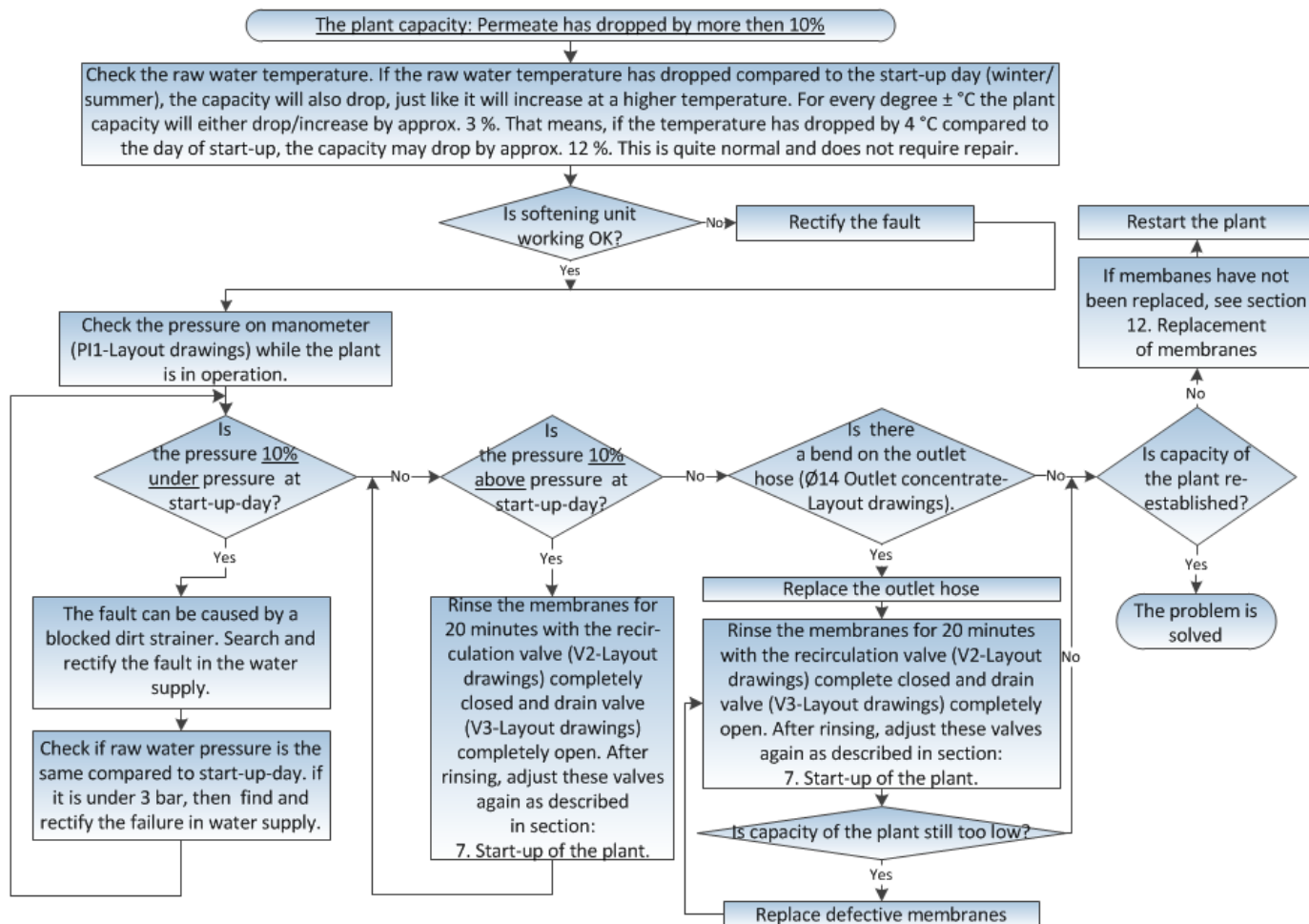
For problem solving, see chapter "9.2 Troubleshooting".



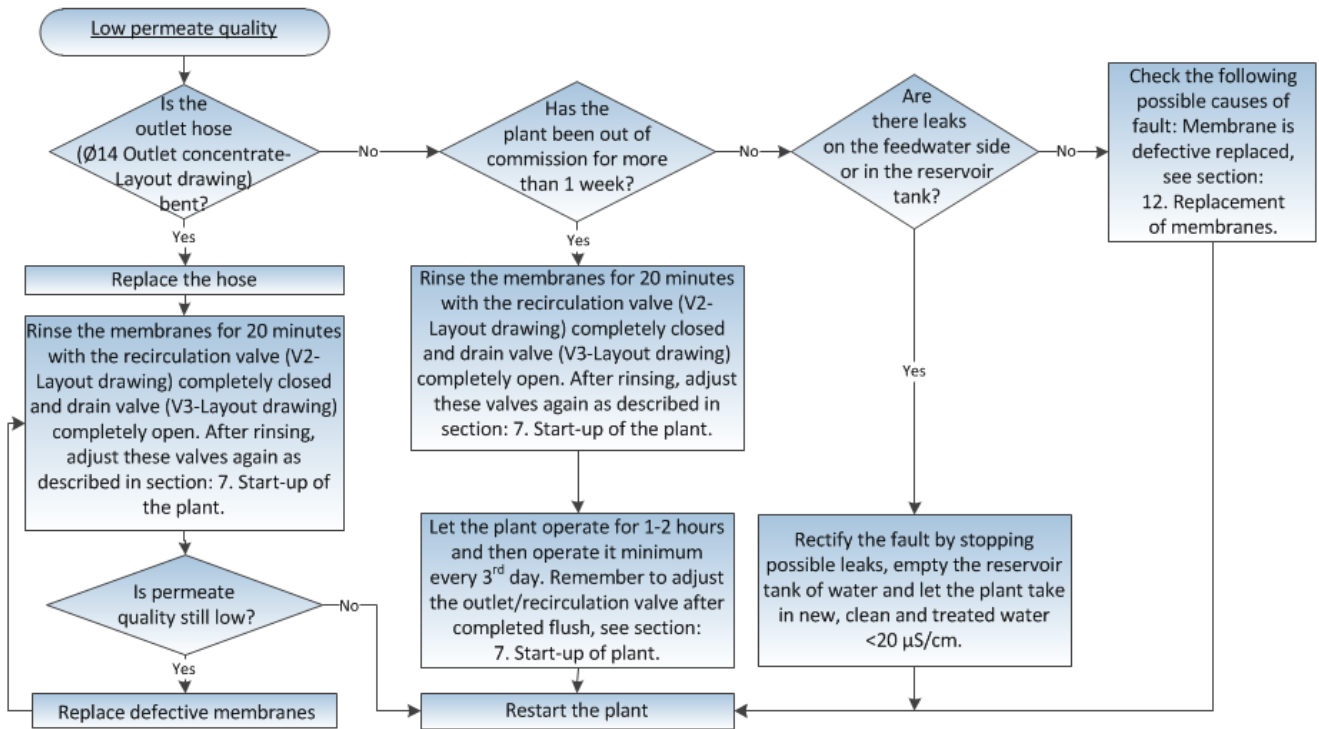
## 9.2 Troubleshooting

This section deals with the problems that may arise on the plant.

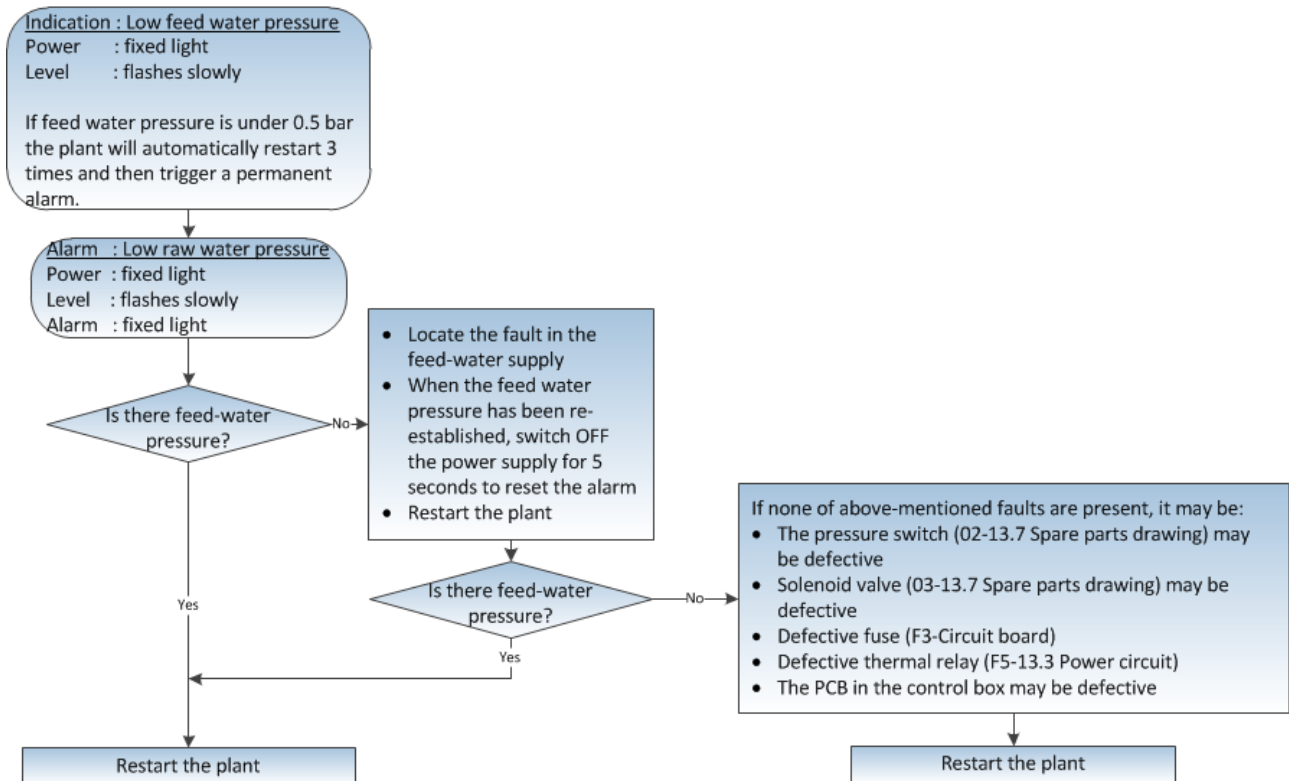
### 9.2.1 The plant capacity has dropped



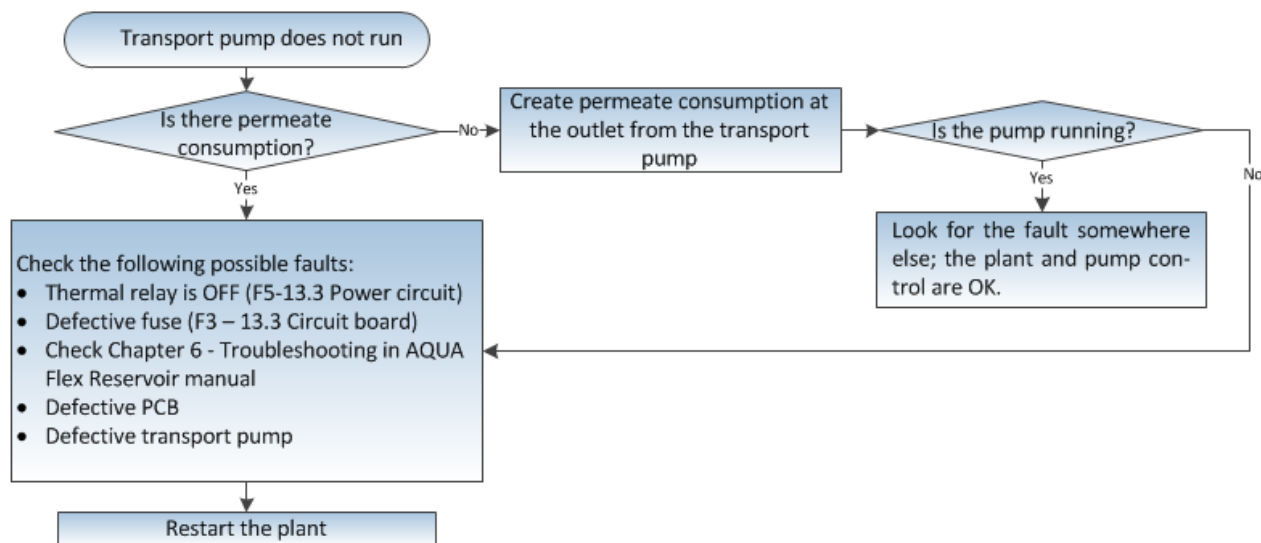
9.2.2 The quality of the treated water is higher than 20 µS/cm



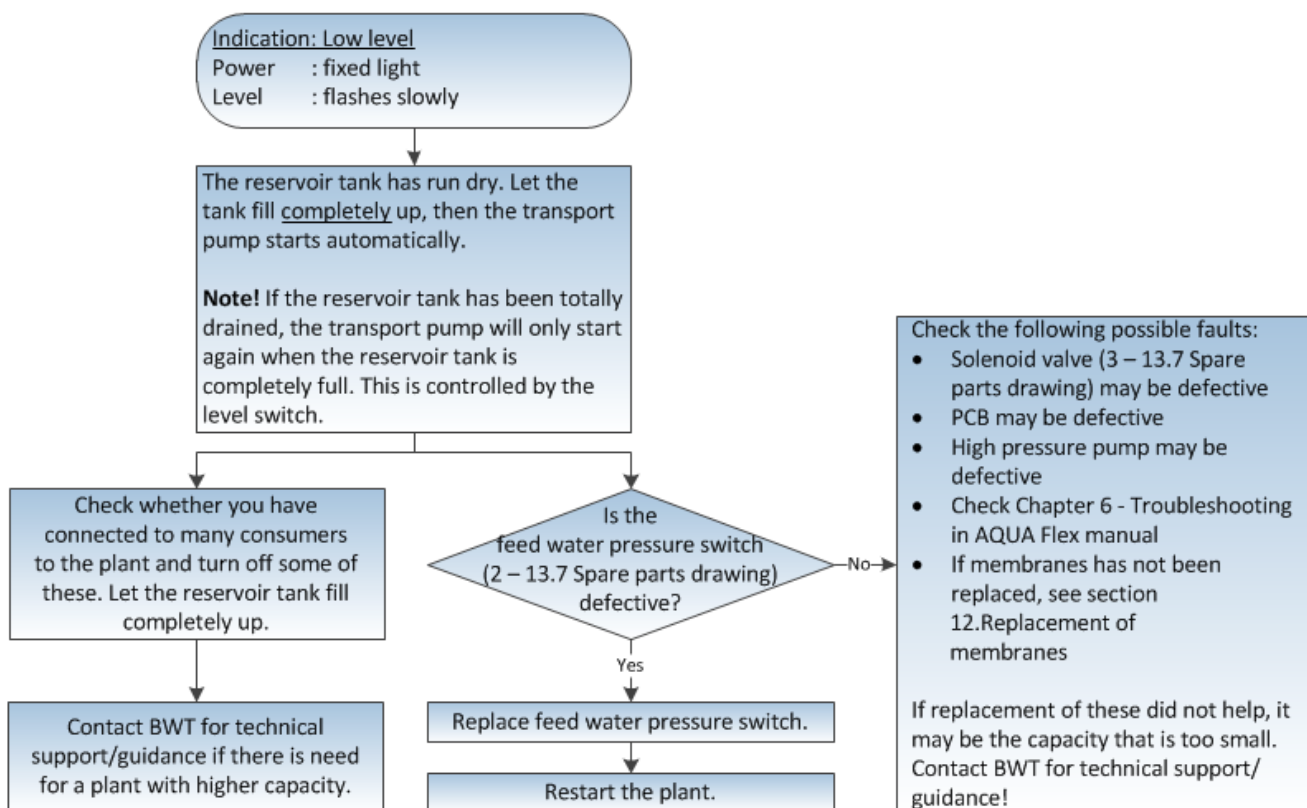
9.2.3 Alarm: Low feed water pressure



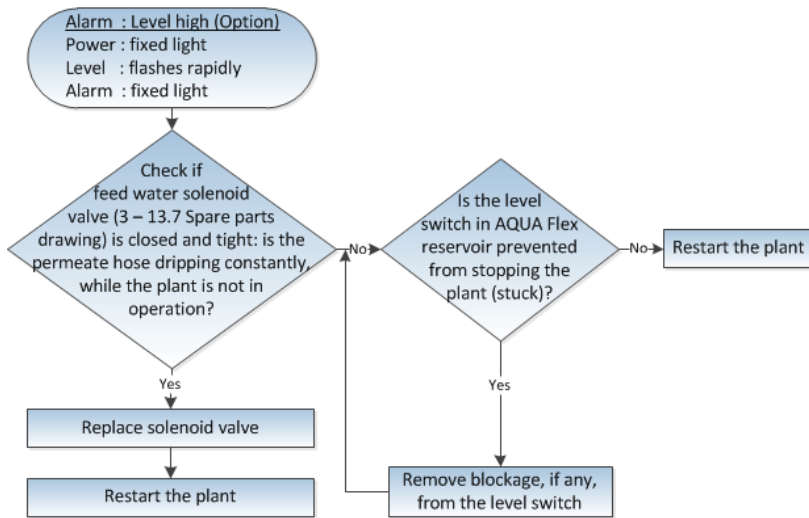
9.2.4 Alarm: Transport pump



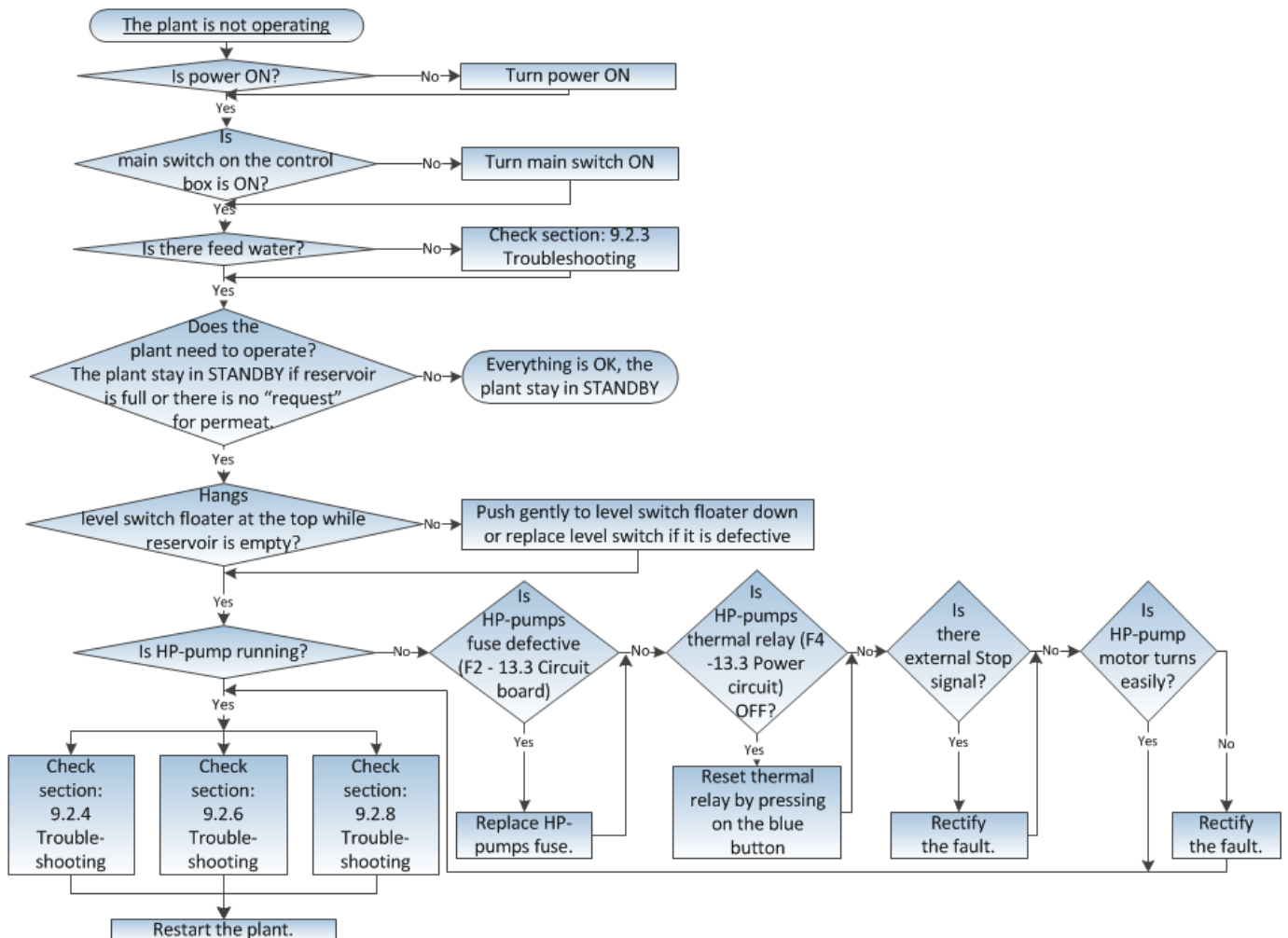
9.2.5 Indication: Level low



9.2.6 Alarm: Level high



9.2.7 The plant is not operating



9.2.8 Alarm: The transport pump stops and starts  
Check AQUA Flex’s manual chapter 6. Troubleshooting

9.2.9 Hard water is measured at the soft-water tap  
Check softening plants manual for troubleshooting

9.2.10 Survey of Alarm Conditions

LED function: In normal operation the LED's are lit corresponding to the components they represent.

						"Re-start ALARM" on TP-pump: (Nothing is working – permanent condition)	Section 9.2.8
						ALARM - Too high water level: (Nothing is working – permanent condition)	Section 9.2.6
						ALARM -Low water pressure and Low water level: (Nothing is working – permanent condition)	Restore feed water pressure to >0.5 bar (Section 9.2.3), then check why water level is low (Section 9.2.5)
						Too low water level (no ALARM): (TP-pump stopped, HP-pump is working)	Section 9.2.5
						"On-time ALARM" - on TP-pump: (Nothing is working – permanent condition)	Section 9.2.4
						ALARM - Too low feed water pressure: (Nothing is working – permanent condition)	Section 9.2.3
						Too low feed water pressure: (HP-pump stopped – TP-pump is working)	Automatic restart (3 times) if feed water pressure is <0.5 bar
						External stop - TP-pump, can be jumped at start-up: (HP-pump is working)	Check the reason for the external stop and rectify the fault
						External stop - HP-pump: (TP-pump is working)	Check the reason for the external stop and rectify the fault
ALARM	LEVEL	TRANSPORT PUMP (TP-pump)	HIGH PRESSURE PUMP (HP-pump)	INLET	POWER	<b>Description of alarm- and fault conditions</b>	<b>Trouble-shooting/ comments</b>
LED's are lit		LED's flashes slowly (1/2 Hz)			LED's flashes rapidly (5 Hz)		

BWT PERMAQ® Pro emits beep tone at Alarm condition (Nothing is working), which can only be neutralised by rectifying the fault, then switching the plant OFF for 5 seconds and switching ON again.

9.2.11 Settings

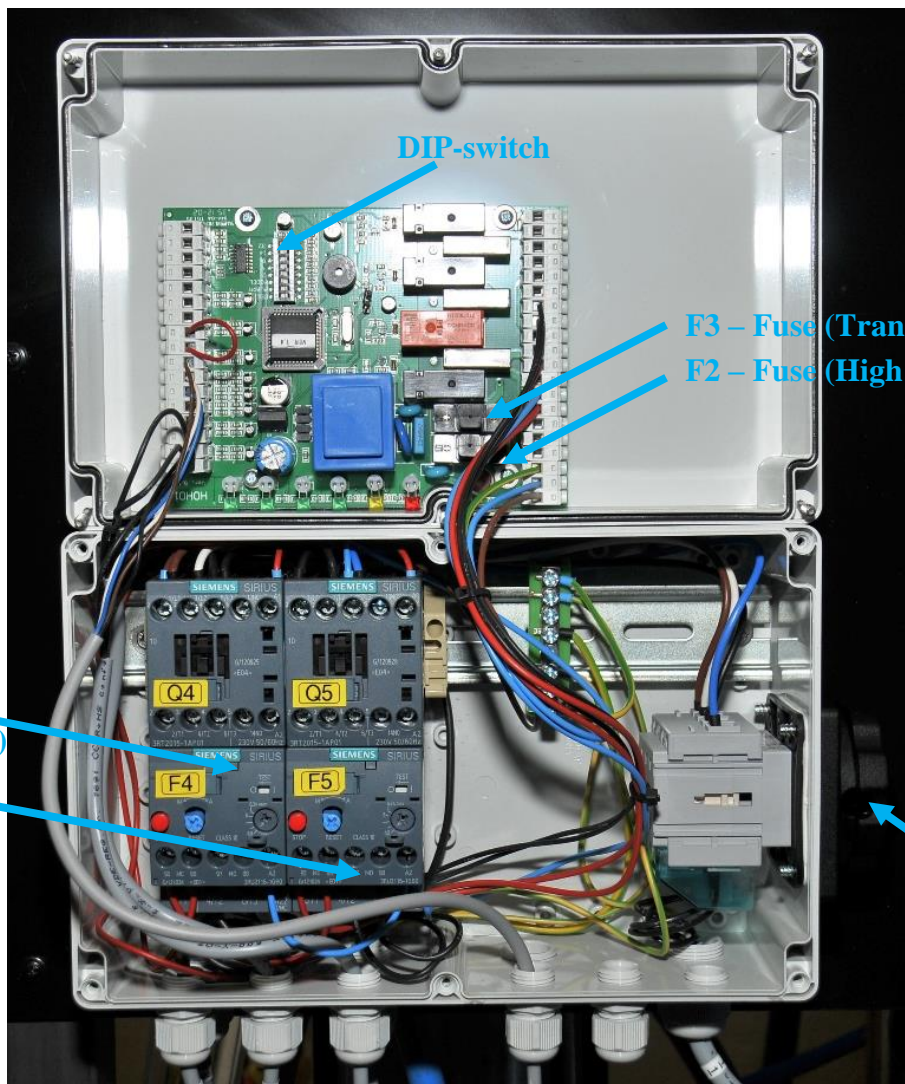
It is possible to adjust the various time settings for Start, Stop and Alarm, plus insert a start-up delay of the pump.

Use of DIP-switch:

- No. 1 High-pressure pump
- No. 2 Transport pump
- No. 3 Selection of BWT PERMAQ® Pro 1800 model
- No. 4-6 Transport pump

Factory settings

DEL / OFF 5 SECONDS	1	ON	DEL / ON 15 SECONDS
ALARM / OFF NO ALARM	2	ON	ALARM / ON STOP AFTER 20 MINUTES
MODEL / OFF PERMAQ COMPACT 41	3	ON	MODEL / ON PERMAQ Pro 1800
	4	ON	2 / ON 20 SECONDS START MAX. 60 PR. HOUR
	5	ON	4 / ON 20 SECONDS START MAX. 90 PR. HOUR
	6	ON	8 / ON 30 SECONDS START MAX. 109 PR. HOUR
	7	ON	16
	8	ON	32



F4 – thermal relay (High pressure pump)  
 F5 – thermal relay (Transport pump)

F3 – Fuse (Transport pump)  
 F2 – Fuse (High pressure pump)

ON/OFF switch

## 10. TECHNICAL SPECIFICATION

## 10.1 Technical specifications

BWT PERMAQ® Pro 1800		
Tag number	Description	Type/data
P1a	High-pressure pump	2.2 kW, 4.45A
P1b	High-pressure pump	2.2 kW, 4.45A
P2 (option)	Transport pump	0.85 kW, 4.5A / 1.2 kW, 4.8A
FI 1	Flow meter	Ø32 PVC
PI 1	Manometer	0-40 Bar, ¼"
V1	Needle valve	Brass
V2	Needle valve	Brass
Y1	Solenoid valve NC	POM
PS 1	Pressure switch NO	¼" 0.5 Bar
PS 2 (option)	Pressure switch NC	¼" -0.2 - 8 Bar
QIS 1 (option)	Conductivity meter	½" Connection for sensor

## 10.2 Technical data

BWT PERMAQ® Pro 1800		1810	1820
Capacity	l/h*	500	1000
Number membranes	pcs	1	2
Maximum water recovery	%	75-80	
Weight (full)	kg	60	70
Salt retention	%*	>99	
Conductivity	µS/cm*	<20	
Power connection	V	400	
Power consumption	kW/m <sup>3</sup>	2,76	2,05
Electrical frequency	Hz	50	
Pipe inlet	inch	¾"	
Concentrate outlet	mm	14	
Permeate outlet	mm	14	
Width, Depth, Height (BxDxH)	mm	650x550x1600	
Water temp. (Min./Max.)	°C	5 / 35	
Inlet water pressure (Min./Max.)	bar	3 / 7	
High pressure pump	Tag number	P1a	P1b

\* At drinking water quality 10°C, 3 bar, max. 500 mg/l total salt content.

## 11. FUNCTIONAL DESCRIPTION

The water is pressed through the RO membrane by means of a high-pressure pump. The permeate (desalinated water) is then led to consumption and can e.g. be collected in a reservoir. The concentrate (the water containing the concentrated salts) is led to outlet. The relation between permeate/ concentrate shall be adjusted manually on the needle valve.

Under normal operating conditions the RO membranes have a long lifetime. But even with a good feed water quality, layers of impurities will, to a certain extent, occur and there will be a slow reduction of the permeate capacity.

## 12. REPLACEMENT OF MEMBRANES

Read this chapter before dismounting/replacing the membranes.

Turn off the power and disconnect the water to the plant.

Dismount the U-lock placed at the top of the membrane pipe. (the U-lock keep the membrane bottom in place).

Remove the pin in the U-lock and pull the lock out of the pipe. The end plates can now be pulled out of the membrane pipe by wriggling the end plates from side to side and simultaneously pull upwards.

Note! it may be necessary to use a puller to get the end plates out of the membrane pipe. Order a puller for a 4" membrane pipe from your usual supplier or from BWT.

The membrane can now be pulled out of the membrane pipe.

Note! at which end the big, black V-cup seal, located on the

outside of the membrane is placed. When the new membrane is to be fitted, this V-cup seal must be fitted at the same end of the membrane as the former one, i.e. if the V-cup seal is located at the top of the membrane pipe, then the new membrane V-cup seal shall also be placed in that way, so that the V-cup seal is located at the top when the membrane is refitted in the membrane pipe.

When all connections have been refitted and the end plates securely fastened with the U-lock, then the plant must be started up again.

Re-connect raw water.

Open the outlet valve completely and close the recirculation valve completely (section 13.7, pos 1).

Lead the permeate hose to drain.

Reconnect power to the plant.

The plant will now be in operation. Let the plant flush in this way for 20-30 minutes.

Then adjust the outlet valve and the recirculation valve.

Check the plant operating pressure on the manometer.

Check that the water quality is  $<20 \mu\text{S}/\text{cm}$ . This can be checked on the permeate hose (conductivity meter is optional equipment). Lead the hose back to the reservoir (option), when the quality is satisfactory.

Check on the flow meter that the plant capacity is satisfactory. The plant is now in normal operation and ready for use.

Make notes in the operating journal:

1. Date of replacement of membranes
2. New capacity on the plant, flow meter F11 (13.7 Spare parts drawing Pos. 9)
3. Water quality, conductivity meter (option)
4. Plant operating pressure, manometer (13.7 Spare parts

drawing Pos. 4)

5. Feed water temperature

6. Feed water pressure



## 13. ANNEX

13.1 P&I Diagram

13.2 Layout drawings

13.3 Wiring diagram

13.4 Start-up test

13.5 Operating journal

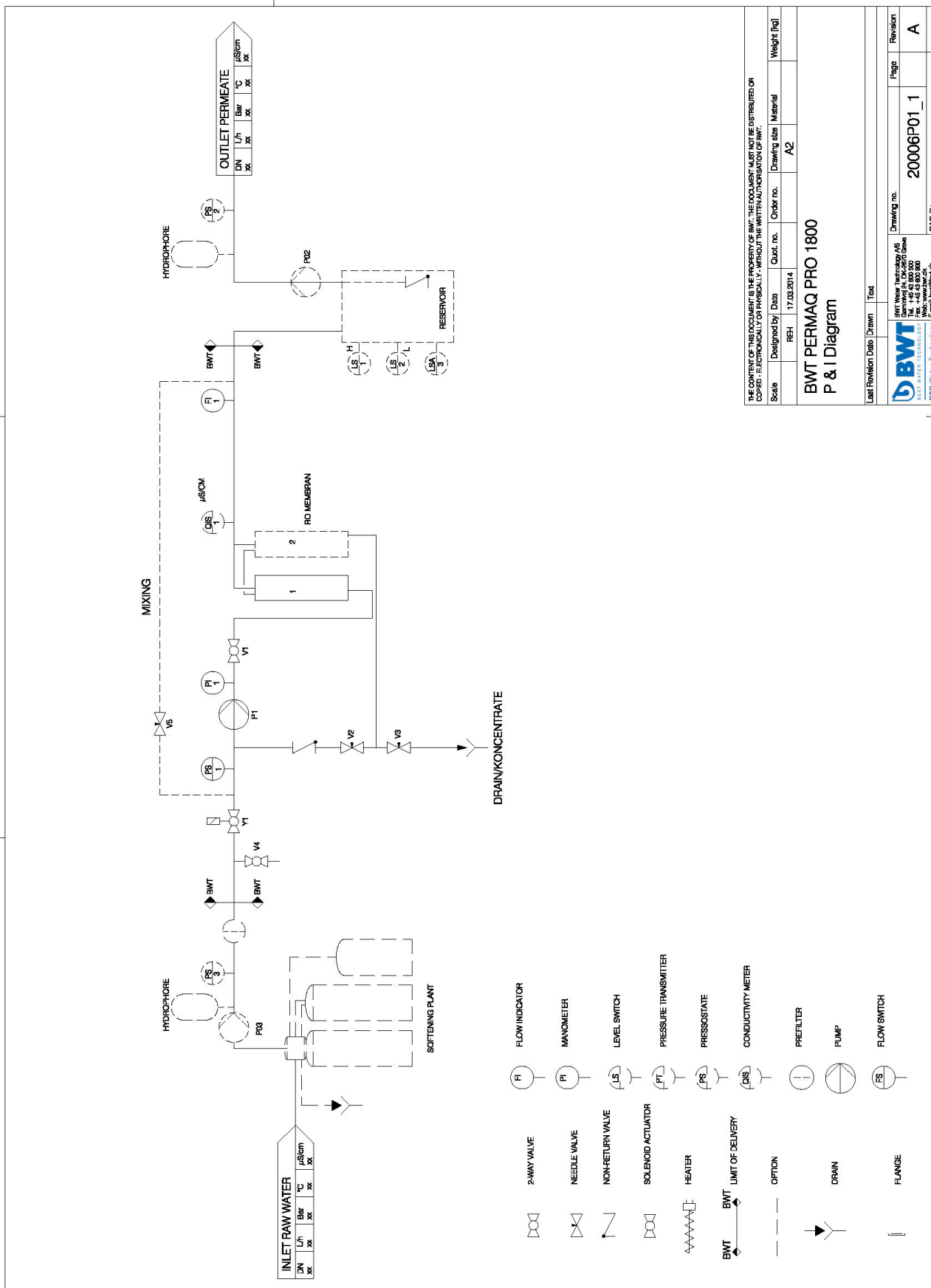
13.6 Spare-parts list BWT PERMAQ® Pro 1800

13.7 Spare-parts drawing

13.8 Options

13.9 Declaration of conformity

### 13.1 P&I Diagram



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Scale	Designed by	Date	Quot. no.	Order no.	Drawing size	Material	Weight [kg]
	REH	17.02.2014			A2		

**BWT PERMAQ PRO 1800**  
**P & I Diagram**

Last Revision	Date	Drawn	Test

 BWT Water Technology AS Denmark   DK-2670 Sønder Tel. +45 46 88 20 00 Fax +45 46 88 20 01 Web: www.bwt.dk Email: bwt@bwt.dk	Drawing no. <b>20006P01_1</b>	Page <b>A</b>
	CAD file:	

13.2 Layout Drawings

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Scale	Designed by	Date	Quot. no.	Order no.	Drawing size	Material	Weight [kg]
1:10	jek	05-02-02			A3		

**BWT PERMAQ PRO 1800**  
Arrangement drawing

Last Revision	Date	Drawn	Text

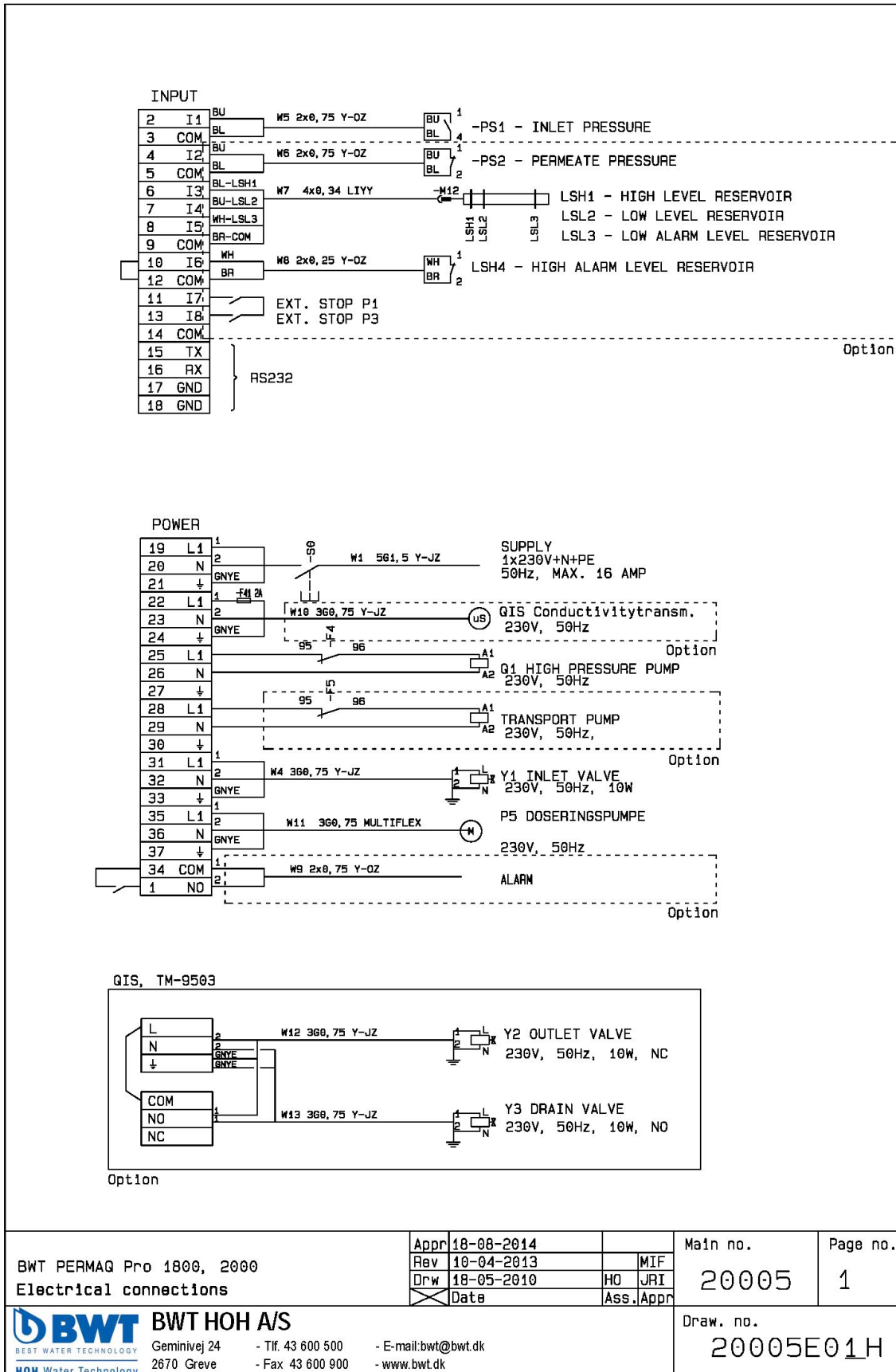
Drawing no.	Page	Revision
20006M02_0	1	A

CAD file: S449M02-1\_A

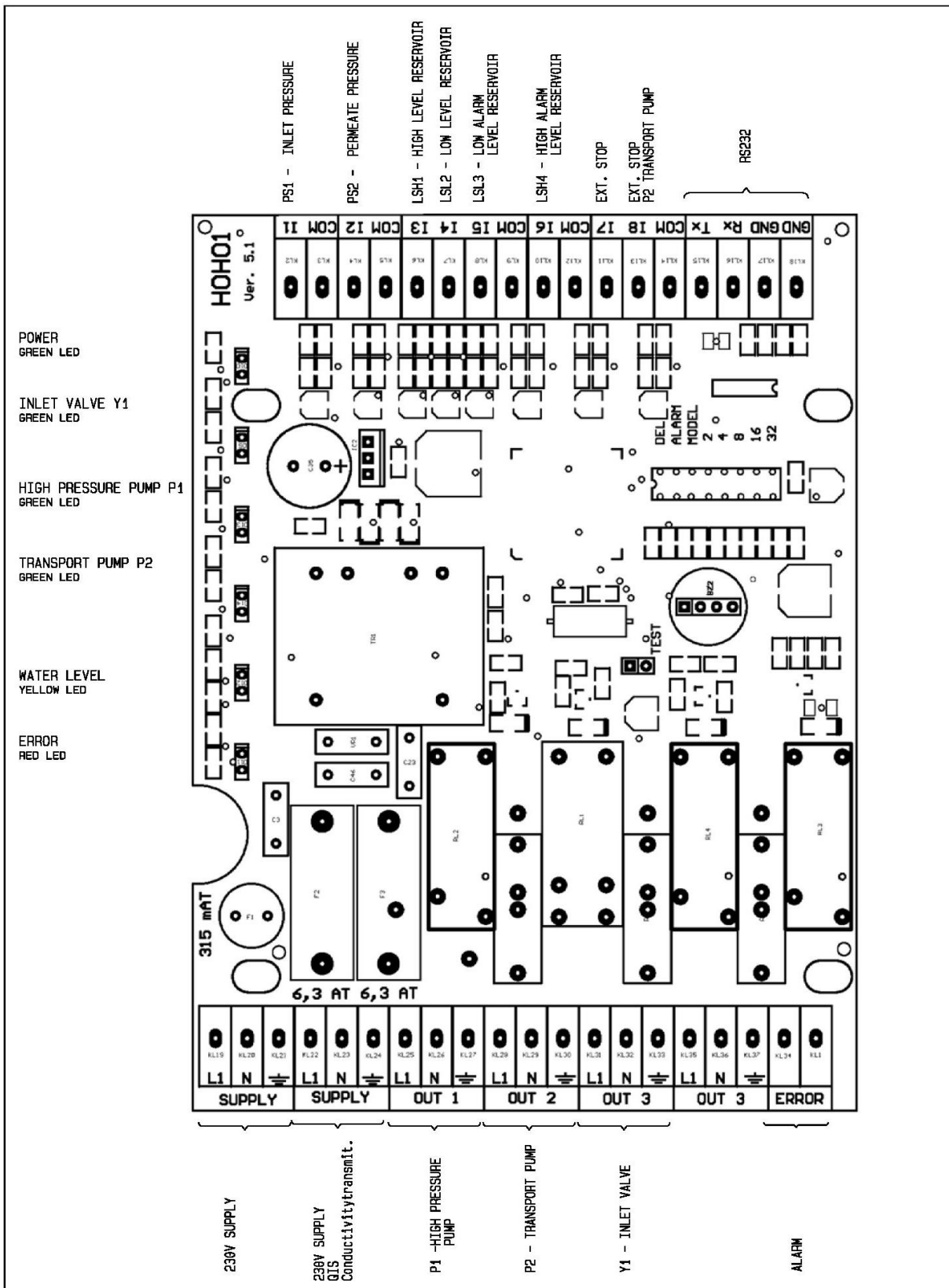
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**HOH Water Technology**

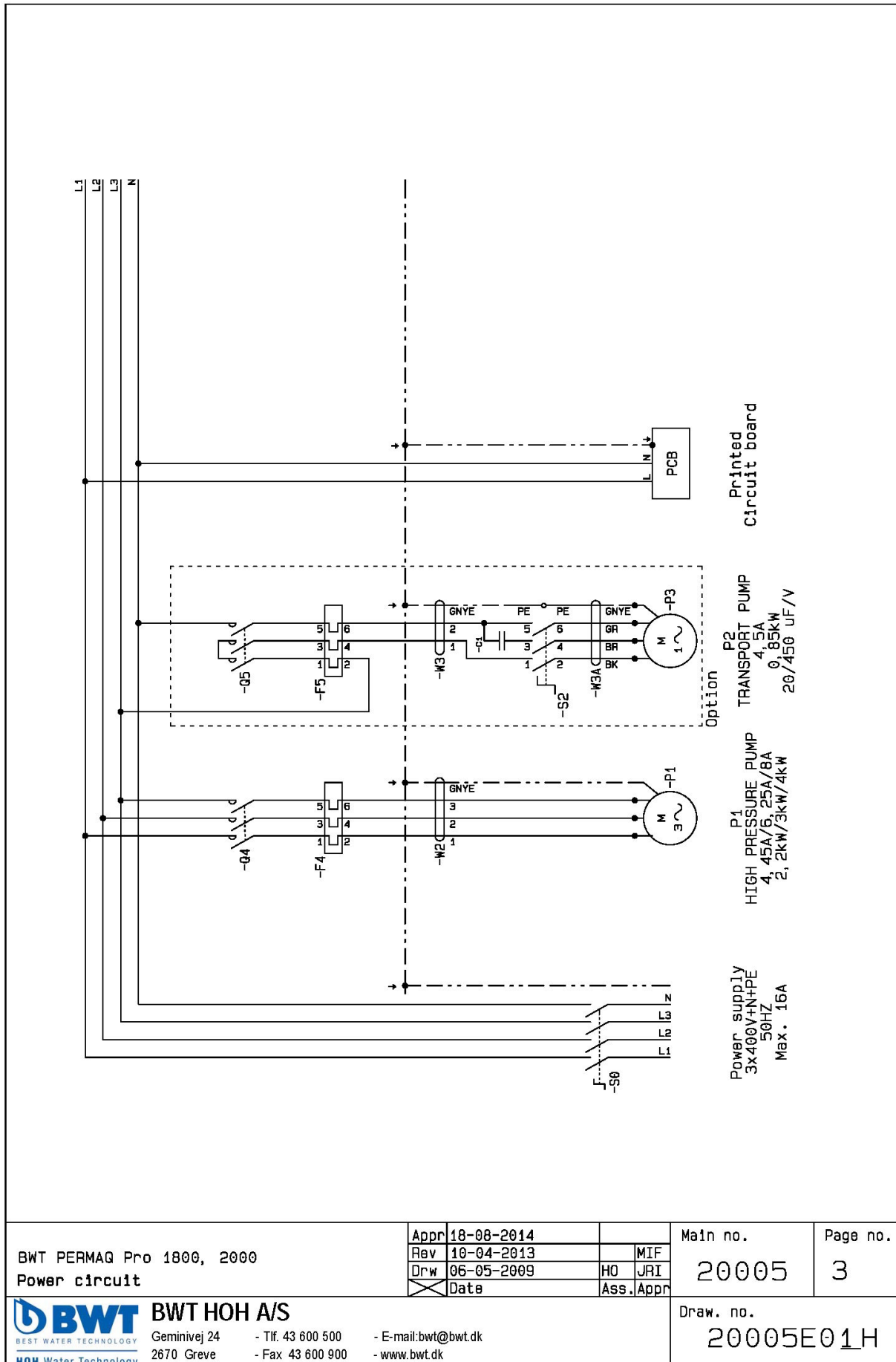
13.3 Wiring Diagram



BWT PERMAQ Pro 1800, 2000 Electrical connections	Appr	18-08-2014		Main no.	Page no.	
	Rev	10-04-2013	MIF			
	Drw	18-05-2010	HO	JRI	20005	1
	Date		Ass.	Appr		
<b>BWT HOH A/S</b> Geminivej 24 - Tlf. 43 600 500 - E-mail: bwt@bwt.dk 2670 Greve - Fax 43 600 900 - www.bwt.dk				Draw. no. 20005E01H		



BWT PERMAQ Pro 1800, 2000 Circuit board	Appr	14-04-2014		Main no.	Page no.
	Rev	10-04-2013	MIF	20005	2
	Drw	06-05-2009	HO JRI		
	Date		Ass.Appr		
BWT HOH A/S Geminivej 24 - Tlf. 43 600 500 - E-mail: bwt@bwt.dk 2670 Greve - Fax 43 600 900 - www.bwt.dk			Draw. no. 20005E01H		



## 13.4 Start-up Test

<b>Start-up test</b>			
The start-up test sheet must be completed and filed together with the operating journal.			
Name of customer:		Plant number:	Work-sheet number:
<b>Test of raw water</b>			
Temperature [°C]:	Conductivity [µS/cm]:	Hardness [°dH]:	Inlet pressure [bar]:
<b>Softening unit</b>		<input type="checkbox"/> YES	<input type="checkbox"/> NO
<i>If "no" skip this section</i>			
Type of plant:		Hardness [°dH] after softening:	
<i>Tick if "yes"</i>			
<input type="checkbox"/> Time-controlled	<input type="checkbox"/> Quantity-controlled	<input type="checkbox"/> Dimensioned correctly for RO	
<input type="checkbox"/> New	<input type="checkbox"/> Old	<input type="checkbox"/> Plant and salt valve set at the correct hardness	
<b>RO-plant</b>			
Type of plant:	Raw -water pressure [bar]:	Outlet press., high-press. pump [bar]:	Recirculation flow [l/h]:
Permeate flow [l/h]:	Concentrate flow [l/h]:	Outlet press., permeate [l/h]:	Conductivity, permeate [µS/cm]:
<input type="checkbox"/> Inlet press. switch is OK			
<input type="checkbox"/> Direction, high-press. pump is OK			
<input type="checkbox"/> Level switch, start/stop of high-press. pump is OK			
<b>Permeate tank</b>			
<input type="checkbox"/> Pre-pressured hydrophore is OK		<input type="checkbox"/> Pressure switch start/stop, transport pump is OK	
<input type="checkbox"/> Level switch have the right length for the plant		<input type="checkbox"/> Drainage protection, transport pump is OK	
<b>Status on start-up</b>			
<input type="checkbox"/> Start-up by BWT		<input type="checkbox"/> Start-up by dealer, specify dealer _____	
<b>Problems on start-up</b>			
<input type="checkbox"/> YES, there were problems at start-up		<input type="checkbox"/> NO, there were no problems at start-up	
<i>In case of problems, please fill in the problem report</i>			
<b>Problem report</b>			
Can the problem be related to the manufacturing?			
<input type="checkbox"/> YES, the problem can be related to the manufacturing		<input type="checkbox"/> NO, the problem cannot be related to the manufacturing	
Can the problem be related to the plant or the installation?			
<input type="checkbox"/> YES, the problem only concerns the plant		<input type="checkbox"/> YES, the problem only concerns the installation	
<input type="checkbox"/> YES, the problem concerns both the plant and the installation		<input type="checkbox"/> NO, the problem does not concerns the plant or the installation	
The plant - we mean only the part of the whole installation which was delivered by BWT (i.e only the plant). The installation - we mean the piping etc. leading to the plant.			
Can the problem be related to the sales department?			
<input type="checkbox"/> YES, the customer was misinformed		<input type="checkbox"/> NO, the customer had been well-informed	
Description, please describe the problem			
<b>Signature</b>			
Name/initials of technician:		Date:	Time consumption for the start-up [hours]:





## 13.6 Spare Parts List BWT PERMAQ® Pro 1800

Position No.	<b>BWT PERMAQ® Pro 1800</b>	Recommended spare parts	Article No.	Recommended replacement frequency
1	¾" Needle valve (recirculation)	1	200731006	
2	Pressure switch 0.5 bar	1	452550005	
3	½" Solenoid valve	1	200752004	
4	Manometer 0-40 Bar	1	452266000	
5	¾" Ball valve	1	200742006	
6	¾" Needle valve (outlet valve)	1	200731006	
7	High-pressure pump (BWT PERMAQ® Pro 1810)		454101224	
8	High-pressure pump (BWT PERMAQ® Pro 1820)		454101225	
9	Flowmeter, Permeate		453012016	
10	Control box complete		451404812	
11	Control PCB complete		506708233	
12	Test valve		200721020	
13	Push-in fitting 14 mm, elbow	1	454090014	3 years
14	Push-in fitting 14 mm x ½", base		454065014	3 years
15	Adapter piece 14 mm x ½"		454060014	3 years
	<b>Membrane/pressure vessel</b>			
16	Pressure vessel		451404079	
17	Membrane	1-2	451404960	*
18	U-lock		451404090	
19	V-Cup seal for membrane	1-2	451404208	
20A	End plate		451404113	3-5 years
20B	End plate		451404112	3-5 years
21	O-ring outside (large)	4-16	451404211	2 years
22	O-ring inside (small)	4-16	451404215	2 years
23	¾" Pressure hose, L=400 mm	1	451404177	
24	¾" Pressure hose, L=190 mm	1	451404179	
25	¾" Pressure hose, L=210 mm	1	451404180	
	<b>Miscellaneous</b>			
	6 mm Plastic hose		454001006	3 years
	14 mm Plastic hose		454001014	3 years
	<b>Spare parts for options</b>			
	Sensor (conductivity meter)		452536007	
	Conductivity meter		452525000	


\* Contact your local BWT dealer for detailed information.

13.7 Spare Parts Drawing

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Scale	Designed by	Date	Quot. no.	Order no.	Drawing size	Material	Weight [kg]
1:10	jek	05-02-02			A3		

**BWT PERMAQ PRO 1800**  
Spare parts drawing

Last Revision Date		Drawn	Text	
BWT HQH A/S Copenhagen DK-2800 Lyngby Tel. +45 43 600 500 Fax. +45 43 600 900 Web: www.bwt.dk E-mail: bwt@bwt.dk		Drawing no.	Page	Revision
 BEST WATER TECHNOLOGY H2O Water Technology		20006002_0	3	A
		CAD file: S449M02-3		

13.8 Options

For BWT PERMAQ<sup>®</sup> Pro 1800 reverse osmosis units you can select between following options, contact \*\*BWT Sales for further information.

13.8.1 Option 1 - Hose Connector Kit

Part No.: 656525800		BWT carry complete assembly kits (hose kits) for BWT PERMAQ <sup>®</sup> Pro 1800 reverse osmosis units
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13.8.2 Option 2 - Softening Units

Part No.: **		For optimal utilization of the water and to prolong the membrane lifetime we recommend installing a BWT softening unit with your BWT PERMAQ <sup>®</sup> Pro 1800.
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13.8.3 Option 3 - Booster Unit

Part No.: 454100560		A booster unit can be installed ahead of the softening unit in case of lacking water pressure.
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13.8.4 Option 4 - Carbon Filter

Part No.: **		In order to reduce the content of free chlorine, pesticides, and organic solvents you may install a carbon filter.
--------------	--	--

13.8.5 Option 5 - Mixing

Part No.: 451202029		If you need to increase the permeate conductivity over 20 µS/cm we recommend mixing for BWT PERMAQ <sup>®</sup> Pro 1800.
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13.8.6 Option 6 - Conductivity Meter

Part No.: 451202013		BWT PERMAQ <sup>®</sup> Pro 1800 units may be equipped with a conductivity meter for measuring the water quality.
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## 13.8.7 Option 7 - Conductivity Meter including a 4-20 mA outlet

Part No.: 451202013 and 452536010		BWT PERMAQ <sup>®</sup> Pro 1800 units may be equip-ped with a conductivity meter for metering and signal output.
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## 13.8.8 Option 8 - Storage Tank

Part No.: **		200-2,000 liter AQUA FLEX reservoir with integrated transport pump and pressure switch used for controlling start and stop of the BWT PERMAQ <sup>®</sup> Pro 1800.
--------------	---	---

## 13.8.9 Option 9 - Mixed-bed

Part No.: **		If a water quality $< 0,5 \mu\text{S}/\text{cm}$ is required, we recommend a BWT HOH Demi Mix (a mixed-bed unit) for post-treatment of the reverse osmosis water.
--------------	---	---

## 13.8.10 Option 10 - Upgrade Kit

Part No.: **		If a larger permeate capacity is required, we recommend installing an extra membrane which is included in the upgrade kit for BWT PERMAQ <sup>®</sup> Pro 1810.
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## 13.8.11 Option 11 - Tool/Spare Part Box

Part No.: 451409000		The tool/spare part box contains the most commonly needed small parts and tools to be used when servicing the BWT PERMAQ <sup>®</sup> Pro 1800, e.g. when replacing membranes.
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## 13.9 Declaration of Conformity

**EC Declaration of Conformity for Machinery**  
**Directive 2006/42/EC, Annex II, A**  
**Low Voltage Directive**  
**EMC Directive**



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herewith declares that:

BWT PERMAQ® PRO 1810, 1820

- is in conformity with the provisions of the Machinery Directive (directive 2006/42/EC)
- is in conformity with the provisions of the following other EC directives
- Low Voltage Directive (2006/95/EC)
- EMC Directive (2004/108/EC)
  
- Place: Greve, Denmark
  
- Date: 18-09-2014

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Lars Jensen  
Head of Product Management



Notes

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