



BWT PERMAQ®
Compact 951 – 953
Reverse Osmosis Plant

For You and Planet Blue.

List of contents

1	General	5
2	Definitions	5
3	Functional description	6
4	Placement of plant	6
5	Water quality	7
6	Water connections	7
6.1	Connection of raw water/inlet water:	7
6.2	Connection of permeate outlet	7
6.3	Connection of outlet hose (concentrate)	8
6.4	Connection of overflow hose	8
6.5	Connection of soft-water control valve	8
7	Electric connections	8
8	Commissioning of the plant	8
8.1	Start-up of softening plant	8
8.1.1	Replacement of regeneration meter disk	9
8.2	Adjustment of outlet amount	10
9	Automatic functions	11
10	Maintenance and Troubleshooting	12
10.1	Maintenance:	12
11	Replacement of membranes	13
12	CIP-cleaning of membranes (OPTION)	13
13	Technical data	15
14	Technical specifications	16
15	Appendix	17
15.1	Survey of Alarm Conditions	18
15.2	Settings	19
15.3	Trouble-shooting	20

15.3.1	Plant capacity has dropped.....	20
15.3.2	Treated water quality is higher than 20 $\mu\text{S}/\text{cm}$	20
15.3.3	Alarm: Transport pump.....	21
15.3.4	Indication: Level low.....	22
15.3.5	Alarm: level high OPTION.....	22
15.3.6	The plant is not operating.....	23
15.3.7	Alarm: The transport pump stops and starts.....	23
15.3.8	Hard water is measured at the soft-water sample valve.....	24
15.4	P&I Diagram.....	25
15.5	Arrangement Drawing.....	26
15.6	Wiring Diagram.....	27
15.7	Start-up test.....	35
15.8	Operating Journal.....	36
15.9	Spare parts.....	37
15.9.1	Spare parts softening plant.....	37
15.10	Declaration of Conformity.....	45

1 General

This assembly and operating instruction applies BWT PERMAQ Compact 950 total desalination plants.

This assembly and operating instruction contains important information about correct installation and operation of the BWT PERMAQ Compact 950 plant, consequently the following is very important:

1. Enclosed "Start-up control" shall be filled in during commissioning and filed along with the operating logbook.
2. The operating logbook shall be updated as described under "Enclosures".
3. There must be a floor drain in proximity of the plant. The drain shall be dimensioned to the max flow from the feed water.
4. The BWT PERMAQ Compact 950 plant removes 95-98 % of all salts. It is possible to post-treat with a mixed-bed or similar if a better water quality is requested.
5. The instruction should be read carefully before assembly and start-up of the plant. Correct installation and service will be a condition for our 12-month warranty.

Therefore, read this instruction before assembling or starting up the plant.

Your BWT PERMAQ Compact 950 plant is made in a compact design with reservoir tank, softening plant and reverse osmosis plant joined in one unit to take up a little space as possible.

Your BWT PERMAQ Compact 950 plant with its compact and good finish is easy to install

since all internal installations are pre-fitted and tested in our workshop.

Your BWT PERMAQ Compact 950 plant is designed for minimum service and for long and unproblematic operation.

However, this is on condition of correct installation and maintenance.

You should therefore read this instruction before taking the plant into use.

2 Definitions

There will be some technical words in this instruction, which we have explained below.

Permeate:

Is the treated, totally desalinated water which is produced by the RO plant and supplied to the reservoir tank.

Concentrate:

The water which is led to drain. This water contains the salts and minerals which have been removed from the water.

Raw water:

The water which is led to the RO plant and which shall be desalinated.

TDS:

The amount of dissolved salts measured in the unit mg/l.

Conductivity:

A designation for the salt concentration of the water, measured in the unit $\mu\text{S}/\text{cm}$. The lower the number, the better is the water quality.

Membranes:

The filters of the plant, which under high pressure and flow are capable of desalinating the raw water.

RO:

The abbreviation for Reverse Osmosis.

Transport pump:

The pump which transports the treated water from the plant reservoir tank to consumer.

Level sensor:

The sensor which emits a signal if the RO plant shall start and stop the transport pump in case of drainage of the reservoir tank.

Softening plant:

A pre-filter which softens the water, i.e. removes hardness from the water.

3 Functional description

The raw water is lead through an ion exchange resin where the water is softened before it is passed beside a pressure switch which ensures the plant against dry running. A sample valve is installed to test the hardness of the water.

The high-pressure pump presses the softened raw-water through the RO membrane high-pressure pump. The desalinated water/permeate will be led to a reservoir. The water with the concentrated salts/concentrate will be led to drain. The relation between permeate/concentrate can be adjusted manually by means of a needle valve.

When permeate is need for consumption a transport pump delivers it to the consumer. A

pressure tank keeps two litres to ensure a steady flow to the consumer. A pressure switch starts/stops the transport pump as required.

There is a bypass valve installed which can be used if power is lost. This will ensure softened water to the equipment if required.

4 Placement of plant

Important! If you move the plant by means of a lifting truck, be careful not to damage the supporting legs underneath the plastic tank.

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

The foundation must be able to stand a weight load of 900 kg in total which is the approx. weight of the RO plant in operation. The outside measures of the RO plant are WxDxH: 1500 x 660 x 1350 mm, but when placing the plant, take into consideration that the cover must be dismantled during maintenance.

You must include 1000 mm extra height in order to be able to extract the plant membranes.

Also make room on the left side of the plant for the water installation, especially the outlet drain from the plant should be considered. There must never be an obstruction in this outlet!

Placing of the plant should be done in such a way that the air intake at the top of the pump never gets covered up.

Furthermore, there are readings which have to be performed on the front of the plant, e.g.

flow meter, manometer, conductivity meter and alarms.

Therefore the front should not be covered up but always remain visible.

In case of an error on the plant, situations may arise where either the level in the reservoir overflows or another kind of leak may occur. Consequently there must be a floor drain in proximity of the plant, placed in a way that prevents such water from causing damage.

5 Water quality

The raw water to be treated in the BWT PERMAQ Compact 950 plant must be drinking water quality with maximum 500 mg/l TDS.

The raw water may maximum contain:

- Fe: 0.05 mg/l
- Mn: 0.05 mg/l
- Free Chlorine: 0.1 mg/l (if higher, a carbon filter must be installed (option))
- Turbidity max. 1.0 NTU
- Siltindex: 3.0
- KMnO₄ max.: 10 mg/l

Maximum temperature: 25°C.

Note! The plant is factory set to operate at 10°C.

If there are doubts about the raw-water composition, a water analysis will have to be made.

The plant must be connected a raw-water pressure of minimum 3 bar and maximum 7 bar.

The quality of the treated water will be <20 µS/cm at 10°C.

6 Water connections

Note! All water connections of the plant must be made in compliance with local regulations.

6.1 Connection of raw water/inlet water:

A ball valve shall be installed at the inlet side of the plant, so that the raw water can be turned off when performing a service check of the plant.

Connect raw water to the top connector at the left side of the plant labeled "raw water". We recommend connection with ¾" flexible pressure hoses. BWT HOH sells complete assembly kits for the RO 950 series.

The best operating result is obtained by connecting to minimum ¾" raw-water pipes. In that way you will usually obtain the necessary pressure and flow to the plant.

If the raw-water connection is too small, there is a risk of outages on the plant due to lacking water pressure/amount, e.g. during flushing of the membranes or when the plant is started up, which may entail a poor function of the softening plant.

6.2 Connection of permeate outlet

Connect the outlet water (water to consumption) to the bottom water connection at the left side of the plant labeled "for consumption". We recommend connection with ¾" flexible pressure hoses.

Note! Totally desalinated water may accelerate corrosion, which is why you must always use corrosion-proof piping for the treated water, e.g. stainless steel or PVC-pipe.

6.3 Connection of outlet hose (concentrate)

The outlet water from the plant (concentrate) is led out through the connection in the middle of the left side of the plant labeled "concentrate". The water is led to floor drain.

Important! The outlet pipe may not be inserted into the water in the floor drain as there is then a risk that this water gets sucked back into the plant during standstills.

Important! There must never be a resistance in the outlet pipe, as this will damage the plant membrane(s).

6.4 Connection of overflow hose

At the left side of the plant the overflow nozzle shall be connected to a ½" plastic hose which shall be led to the floor drain. This overflow is a safety overflow in case of errors occurring on the plant level sensor and the reservoir tank consequently gets overfilled.

6.5 Connection of soft-water control valve

Install the test valve on the left side of the plant. The test valve is to be fitted on the connection closest to the front, see encl. 14.2 fig. 1 (the valve is in the salt tank).

7 Electric connections

Note! The electric connections must be done in compliance with local regulations.

The electric connection to the BWT PERMAQ Compact 950 plant must be as follows:

Voltage: 3 x 400 Volt + 0 + Earth fuse: 16 Amp – 3.5 kW

All internal connections in the plant like e.g. pump control and level control have been preassembled in our factory. They only have to be connected to the main current in the terminal box.

See also wiring diagram (enclosure).

8 Commissioning of the plant

Check before start-up that all water and electric connections are done as described in previous chapters and in compliance with local regulations.

8.1 Start-up of softening plant

1. Check that the number (see encl. diagram page 6) of the standard-mounted regeneration meter disk fits the actual hardness on site. If not, the meter disk (water meter) must be exchanged, see illustrations 2.1, 2.2 and 2.3 on page 5. You can order the correct meter disk from BWT HOH or your supplier.
2. The brine valve has been pre-adjusted in our factory, but it should always be checked that the float (A-figure 1) is halfway up the shaft as a minimum when looking from the top of the float. The water must be above the grid plate in order to be in contact with the slat. This also applies to the yellow plastic ring (B-figure 1) under the float; it must be pressed home.
3. The valves on the in- and outlet side and the bypass valve (if fitted) must be closed.
4. Open the valves at the intake side a little so that the filter slowly fills

withwater. At the same time water will be filled into the brine tank by means of the brine valve.

5. Put the one and then the other tank in backwash position ofr a while to get any air out of the system. This is done by pressing down the crosshead screw in the middle of the automatism and simultaneously turning it clockwise. Check that this makes the water run out the discharge hose to drain.
6. When the air is out, put the filter in operation (at position 12 or 6 o'clock) by turning the crosshead screw once more.
7. Then open the valves on the outlet and intake sides completely.
8. Check that water runs into the brine tank. Check that the water is above the grid plate (approx. 5 cm above).
9. Fill up the tank with BWT HOH salt tablets.
10. Normally there shall be enough salt in the cabinet to cover the water completely.
11. Now the plant is ready for service and will supply softened water instantly.

8.1.1 Replacement of regeneration meter disk

Remove the top cover of the automatism fig. 2.1 (bolt with hexagon head SW AF ¼").

Take out the plastic mushroom together with the O-ring and the spring fig. 2.1

When taking out the existing meter disk take care not to remove or move other parts in the control element.

When installing the new meter disc, push the top blocking device (catch) aside with a small screwdriver. See fig. 2.2

Replace the spring and the plastic mushroom with the O-ring fasten the cover. The pin protruding from the underside of the cover must be at position 5 o'clock see fig. 2.3.

Press the cover back in place – If the cover cannot be pushed home manually – check if all pins/parts have been placed correctly.

Wrong fitting of the meter disc will cause the plant to get operating trouble after a short while and it will supply hard water. Consequently, it is very important that this is carried out with the greatest care.

Capacity hardness degrees dH°/litre per regeneration	
Disc number	
1	7°dH – 2280 litre
2	14°dH – 1140 litre
3	21°dH – 760 litre
4	28°dH – 570 litre (standard)
5	35°dH – 456 litre
6	42°dH – 380 litre
7	48°dH – 325 litre
8	56°dH – 285 litre

Before start-up, the softening plant must be adjusted to the actual hardness in the raw-water supply and then started up. This is done by replacing the water meter disk, so that it matches the actual hardness.

Slowly open the raw-water supply and close the "by-pass" valve (encl. 14.2 Q fig. 2).

Check that all water connections are tight.

Fill the salt tank with salt tablets. Use only salt tablets and make sure that these are of a pure quality, e.g. type BWT.

The soft-water plant is now ready for operation. Check if the plant supplies soft water on the soft-water check valve at the left side of the cabinet. Test set is included. (see instruction in the box).

Pull the permeate hose (encl. 14.2 A fig. 2) out of the reservoir tank and lead it away from the tank to a drain. Take care not to damage the PVC fitting on the flow meter.

Open the outlet valve completely (encl. 14.2 I fig. 2).

Now turn on the power supply.

Now the plant is operating.

Check that the motor is running in the right direction.

The plant must operate and flush to drain for 20-30 minutes to rinse out chemical residue before readjusting the outlet valve.

After flushing, the outlet valve shall be adjusted (encl. 14.2 I fig. 2) again.

8.2 Adjustment of outlet amount

The outlet amount must be adjusted at 25 %, i.e. if the plant produces 400 l/h, 133 l/h must be led to sewer. This adjustment is very important to avoid the plant membranes from getting damaged.

The plant is now adjusted at a capacity of 75/25, which means 75 % permeate and 25 % concentrate to drain. An easy way to check this is by multiplying the permeate capacity by 1/3.

The outlet amount is measured by timing the produced outlet water. E.g. if 300 litres of permeate is produced per hour, you must produce 100 litres to drain per hour which corresponds to 1.67 l/min. This can be checked with a measuring cup.

When the requested 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 be checked after the 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 at the prescribed outlet amounts. If the needle valve is closed, so the outlet amount becomes reduced, the plant membrane(s) will be damaged.

NB! After the valves have been locked in position, the plant must be started and stopped 4-5 times, and then the flow must be checked again and the valves readjusted if necessary.

Check on the high-pressure manometer (encl. 14.2 E fig. 2) that it shows the correct operating pressure.

Approx. operating pressure:

951-S 24 bar

952-S 19 bar

953-S 19 bar

Note that an operating pressure may vary at different temperatures and capacities.

Now check the quality of the treated water on the permeate hose (encl. 14.2 A fig. 2) to

establish if the conductivity is below 20 $\mu\text{S}/\text{cm}$, this can be read on the conductivity meter (optional equipment).

Fill the reservoir tank with treated water < 20 $\mu\text{S}/\text{cm}$.

Write operating data in enclosed operating logbook (see encl. – Operating logbook).

1. Plant operating pressure – can be read on the high-pressure manometer (encl. 14.2 E fig. 2).
2. Permeate capacity – can be read on the flow meter (encl. 14.2 F fig. 2)
3. Also write down raw-water pressure and raw-water temperature in the operating logbook.

The transport pump (encl. 14.2 G fig. 2) now has to be deaerated. This is done by filling in treated water through the filling hole (N figure 3) which is placed at the top of the pump head. Dismount the plug and fill in treated water until it overflows (approx. 3-4 litres) and then insert the plug again. The pump is now aerated and ready for operation. Pressure switch and pressure tank are factory pre-set and do not have to readjusted.

Note! The transport pump cannot be started until the reservoir tank is completely full.

Wait until the reservoir tank is completely full. Check that the level sensor (encl. H fig. 2) automatically stops the plant when the reservoir tank is full. NB: Do not touch the level sensor.

Create a large consumption of treated water. Check if the transport pump starts automatically. Let the pump operate a while with a large flow in order to get air out of the pump housing. Check if the pump supplies

water and pressure. If it does not, try deaerating it once more as described previously.

When the transport pump has been approved, close the consumption of treated water. Wait for the transport pump to stop automatically.

Note! The transport pump does not stop until 10-15 sec. after the consumption has ceased due to the built-in time delay in the control box.

Once again create a consumption of treated water and this time let the transport pump empty out approx. 200 litres of the content in the reservoir tank. Check if the RO plant automatically starts and produces treated water. This can be checked on the flow meter.

Check if the plant stops automatically by too low raw-water pressure or lacking raw-water supply. This is done by slowly closing the raw-water supply while the plant is operating. When the water supply has been stopped, the plant shall stop automatically within 5 sec.

In order to put the plant back into operation, the water supply must be re-established and the plant power supply interrupted for 20 sec. and then reconnected. The plant will again automatically be in normal operation.

The plant is now started and ready for operation.

9 Automatic functions

The BWT PERMAQ Compact 950 plant is equipped with a control box which has following control functions integrated:

Level sensor for start/stop of the high-pressure pump. Alarm low level.

Start and stop of high-pressure pump.

Solenoid valve inlet raw water.

Pressure switch for start/stop of the transport pump (Stop 4.2 bar Start 3.7 bar).

Option: Conductivity meter 0-200 $\mu\text{S}/\text{cm}$ with potential-free alarm outlet.

10 Maintenance and Troubleshooting

10.1 Maintenance:

The RO plant is produced and designed for a minimum of servicing and maintenance.

However, there are some functions which should be checked regularly. (The interval is described in the following).

Following must be checked regularly:

If the operating conditions of the plant or/and capacity is changed compared to the day of start-up, then the plant shall be checked for possible cleaning of membranes or/and adjustment of the plant capacity.

- 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)

See chapter dealing with trouble-shooting.

Daily:

1. Take a daily sample of the water from the softening plant ahead of the RO-plant; the hardness must be less than 1°dH.
2. Check also the salt bin, fill up if necessary - and read:

3. Capacity permeate: (encl. 14.2 F fig. 2)
4. Conductivity: (option)
5. Pressure after the high-pressure pump: (encl. 14.2 E fig. 2)

Every 6 months:

1. Check-up of pumps. Follow the manufacturer's guidelines.
2. Check pipelines and connectors for leaks.
3. Check all pressure switches, i.e. their function and settings.
4. Make a release test of the alarm.
5. Replace defective/buzzing switches and relays.
6. The brine tank has to be emptied and cleaned.

Note! If the plant has to be out of operation for a long period, or if it may be exposed to frost, each membrane element must be preserved.

For how long the plant can be out of operation without preserving the membranes, depends on how extensive the organic growth is. When using surface water, the membranes must be preserved by standstills lasting 3 days or longer, and when using ground water, the membranes must be preserved by standstills lasting 7 days or longer.

When preserving membranes, they must be filled with a solution consisting of:

Mixture ratio	Preservation [%]	Frost protection [%]
Mono Propylene glycol	-	20
Sodium bisulphite	1	1

For preservations lasting longer you must check the organic growth. When protecting against frost take care that the pH value never drops to a value below pH 3. In that case there is a risk that the bisulphite transforms into sulphuric acid.

11 Replacement of membranes

Read this chapter before dismounting/replacing the plant membranes.

Switch off the power and water to the plant.

Dismount the U-lock placed at the top of the membrane pipe. (The U-lock holds the membrane end plates in place).

Remove the split pin from the U-lock and pull the U-lock out of the pipe.

Now pull the end plate out of the membrane pipe by wriggling the end plate from side to side and pulling at the same time.

Now pull the membrane out of the membrane pipe.

Note! At which end the large, black O-ring is placed inside the membrane. When the new membrane is to be fitted, this o-ring shall be placed at the same end of the membrane as the old one.

When all connections have been refitted and the end plates securely fastened with the U-lock, the plant shall be restarted. See chapter "Start-up of Plant"

Note in the operating logbook:

1. Date of replacement of membranes
2. New capacity of the plant (flow meter F11)(encl. 14.2 F fig. 2)
3. Water quality ($\mu\text{S}/\text{cm}$)
4. Plant operating pressure (manometer)

5. Raw-water temperature

6. Raw-water pressure.

12 CIP-cleaning of membranes (OPTION)

Introduction

The plant is not equipped with a CIP unit as standard however it is available as an option.

During normal operation, dependent on inlet, water quality, temperature, operating conditions etc. the RO membranes will successively loose capacity due to the water's varying content of mineral salts, biological matter, colloid particles and other insoluble, organic particles.

These deposits will accumulate during operation and cause an increased pressure drop across the membrane and thus a reduction in capacity and poorer water quality.

Membranes must be CIP-cleaned at least once a year or immediately when the capacity has dropped 10 % compared to original capacity.

In this connection it should be noted that the capacity drops by lower water temperatures (approx. 3 % per °C-). If this is the case, a CIP cleaning is not necessary.

Conditions:

It is necessary to perform CIP cleaning with chlorine-free water of a good quality and a temperature of approx. 55 °C. We recommend using permeate on this plant, however pre-treated soft water may also be used.

During circulation of cleaning agent in the membranes, the temperature may never

exceed 35 °C and the pH value must be kept between 2 and 11.5.

The flow direction during CIP cleaning must be the same as during operation.

BWT CIP 4 is an acid cleaning agent used for dissolving inorganic deposits including iron, whereas the alkaline cleaning agent BWT CIP 10 is used for dissolving organic deposits including oil.

Always start by using BWT CIP 10 and then use BWT CIP 4. Follow the manufacturer's safety directions concerning handling of dangerous chemicals.

BWT CIP 4 is sold by BWT HOH

Article number: **701957020**

BWT CIP 10 is sold by BWT HOH

Article number: **701957010**

Never use sulphuric acid H₂SO₄ for CIP cleaning as there is then a risk of precipitation of gypsum (calcium sulphate).

13 Technical data

BWT PERMAQ Compact 950	Unit	951-S	952-S	953-S
Capacity	l/h	400	600	800
Max recovery	%	80		
Salt reduction	%	98		
Conductivity	µS/cm	<20		
Reservoir	litre	500		
Electric connection	V	400		
Max. power consumption	kW	3,5		
Electric frequency	Hz	50		
Fuse	A	16		
Pipe inlet diameter	"	¾		
Concentrate outlet diameter	"	¾		
Permeate outlet diameter	"	¾		
Height	mm	1360		
Length	mm	1580		
Depth	mm	680		
Max. water temperature	°C	25		
Raw water pressure (min / max)	bar	3 / 7		
Weight (dry)	kg	300		
Weight (full)	kg	900		
Number of membranes	pcs.	1	2	3
High-pressure pump		MTR3-26/26		
Transfer pump		CM3-5		
Softening unit		SK-613		

14 Technical specifications

Discharge end with fittings for membrane pipe	BWT 4" end cap Material: PVC
RO membranes	BWT membrane 1-3 pcs. Membrane delivery pipe: Vinylester/fibreglass
High-pressure pump	Pump: Grundfos MTR3-26/26 Operating pressure: 12,6 - 17,2 bar Power: 2,2 kW, 3x400 V, 50 Hz
Transport pump	Pump: Grundfos CM3-5 Operating pressure: 3,4 – 4,59 bar Capacity: 3,1 m ³ /h Power: 0,65 kW, 3x400 V, 50 Hz
Safety pressure switch – inlet	Suco 0,5 bar
Pressure switch – outlet	Danfoss switch, stop at 4,0 bar – start at 3,0 bar
Reservoir	Volume approx. 500 l Material: plastic PE (FDA approved)
Pressure tank	Volume 2 litre stainless steel, pre-pressure 2,9 bar.
Solenoid valve	Danfoss "Evsit 12", 230 V, 50 Hz
Control unit	BWT electrical control unit
Ejector	Ellehammer 2.5/4.5
Level switch	BWT level switch Material: PVC
Noise level	<70 dB (A)
Softening unit	SK 613 Quantity-controlled Capacity: 20l/min. continuously Max. hardness: 30° dH
Salt tank	Integrated, 100 litres

15 Appendix

15.1 Survey of Alarm Conditions

LED functions: During normal operation the LED's are lit corresponding to the components they represent.

						"Re-start ALARM" on TP-pump: (Nothing is working – permanent condition)	Check thermal relay in control box
						ALARM – High water level: (Nothing is working – permanent condition) OPTION	
						ALARM – Low water pressure and low water level: (Nothing is working – permanent condition)	Restore raw-water pressure to >0,5 bar, then check why water level is low
						Low water level (no ALARM): (TP stopped – HP working)	
						"On-time ALARM TP pump" (Nothing is working – permanent condition)	
						ALARM – Low raw-water pressure. (Nothing is working – permanent condition)	
						Low raw-water pressure (HP pump stopped – TP pump working)	Automatic restart (3 times) if raw-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)	High-pressure pump (HP)	Inlet	Power	Description	Trouble-shooting / comments

● ALARM

● LEVEL

● TRANSPORTPUMP

● HIGH PRESSURE PUMP

● INLET

● POWER

LED's are lit	LED's flashes slowly (1/2 Hz)	LED's flashes rapidly (5 Hz)

BWT PERMAQ Compact 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.

15.2 Settings

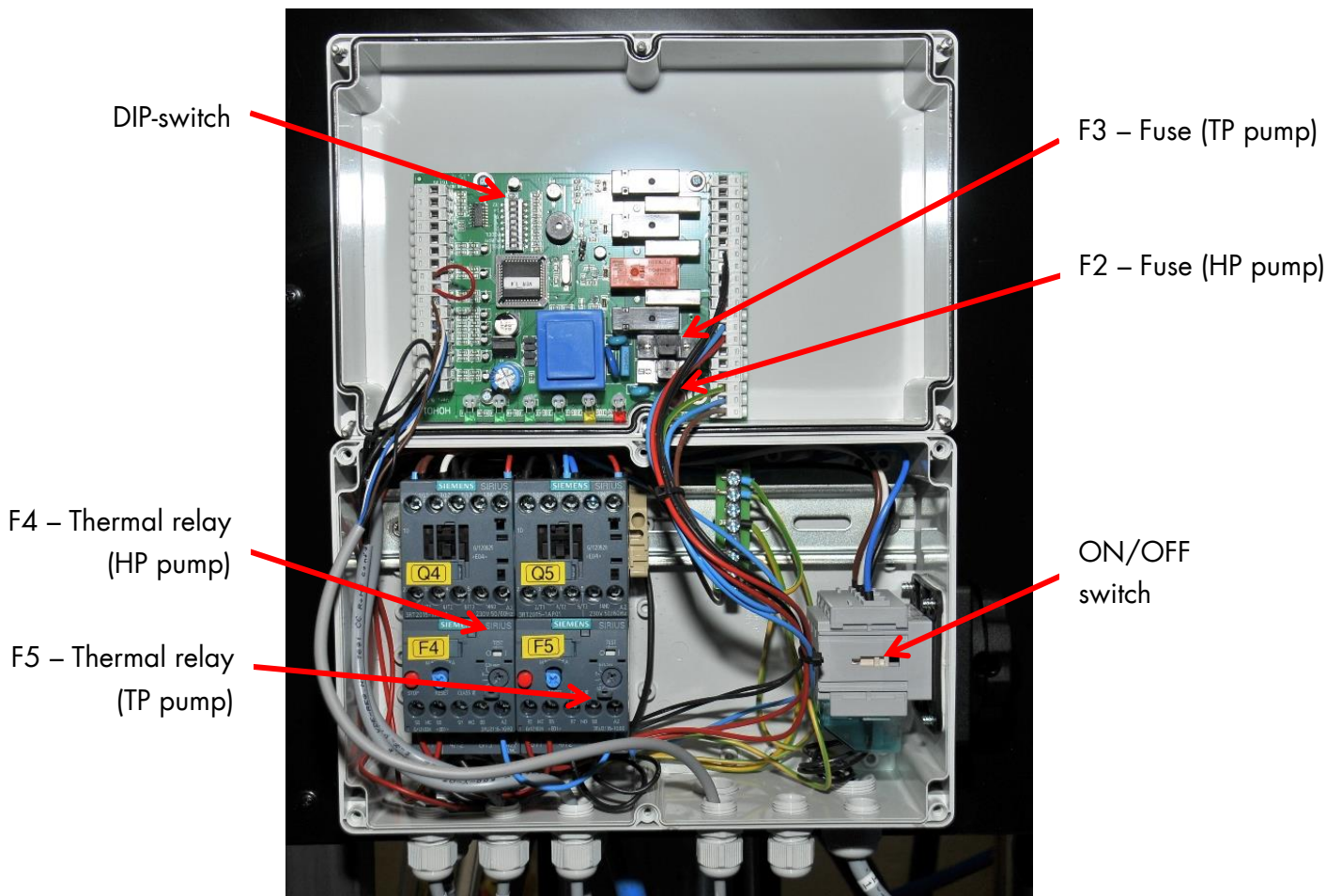
It is possible to adjust the various time settings for start, Stop and Alarm, plus insert a start-up delay of the pump.

Use of DIP-switch:

- No. 1 High-pressure pump
- No. 2 Transport pump
- No. 3 Selection of RO model
- No. 4-6 Transport pump

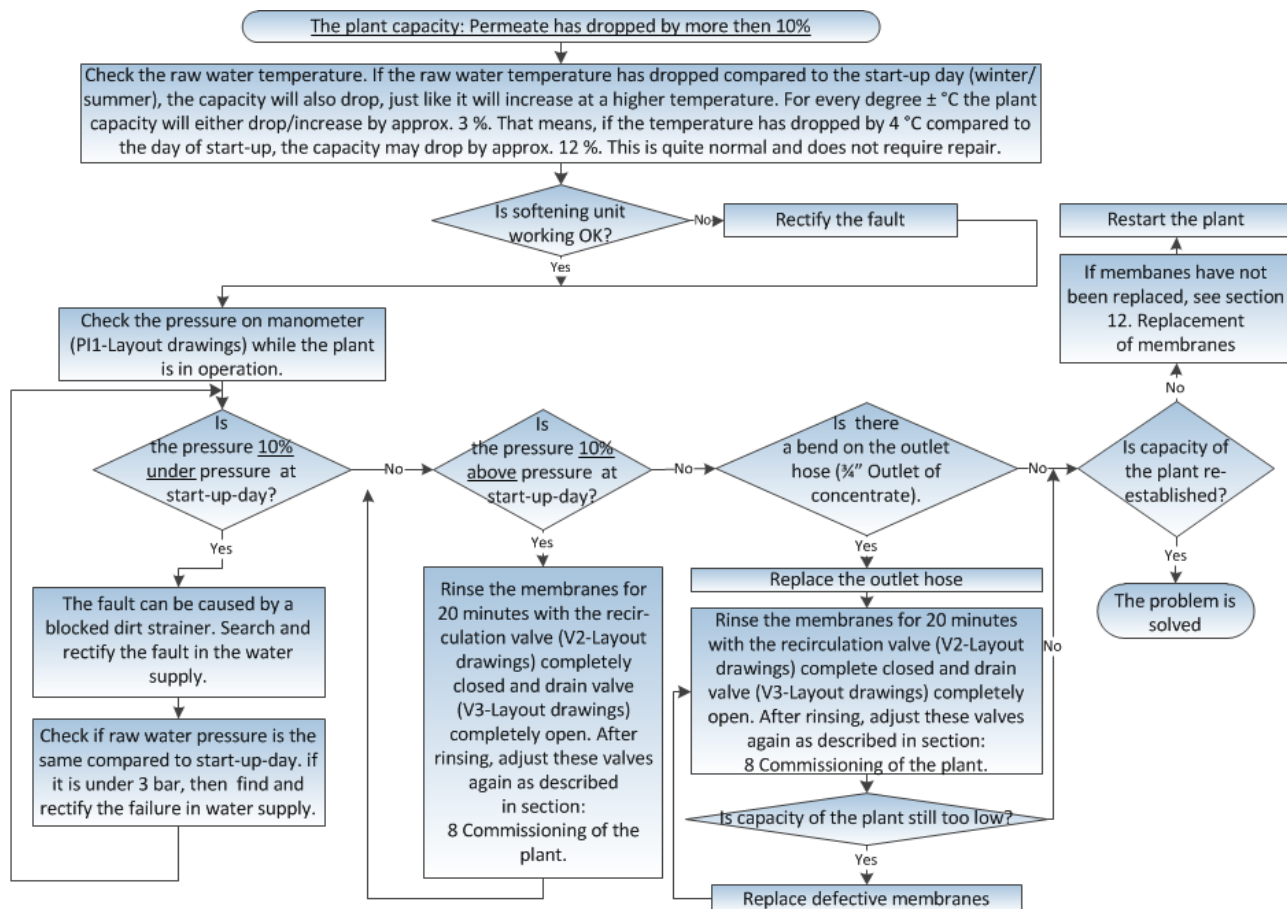
FACTORY SETTING

DEL / OFF 5 SECONDS	<input checked="" type="checkbox"/>	NO	DEL / ON 15 SECONDS
ALARM / OFF NO ALARM	<input checked="" type="checkbox"/>	NO	ALARM / ON STOP AFTER 20 MINUTES
MODEL / OFF RO-41	<input checked="" type="checkbox"/>	NO	MODEL / ON RO-950
	<input checked="" type="checkbox"/>	NO	2 / ON 20 SECONDS START MAX. 60 PR. HOUR
	<input checked="" type="checkbox"/>	NO	4 / ON 20 SECONDS START MAX. 90 PR. HOUR
	<input checked="" type="checkbox"/>	NO	6 / ON 30 SECONDS START MAX. 109 PR. HOUR
	<input checked="" type="checkbox"/>	NO	16
	<input checked="" type="checkbox"/>	NO	32

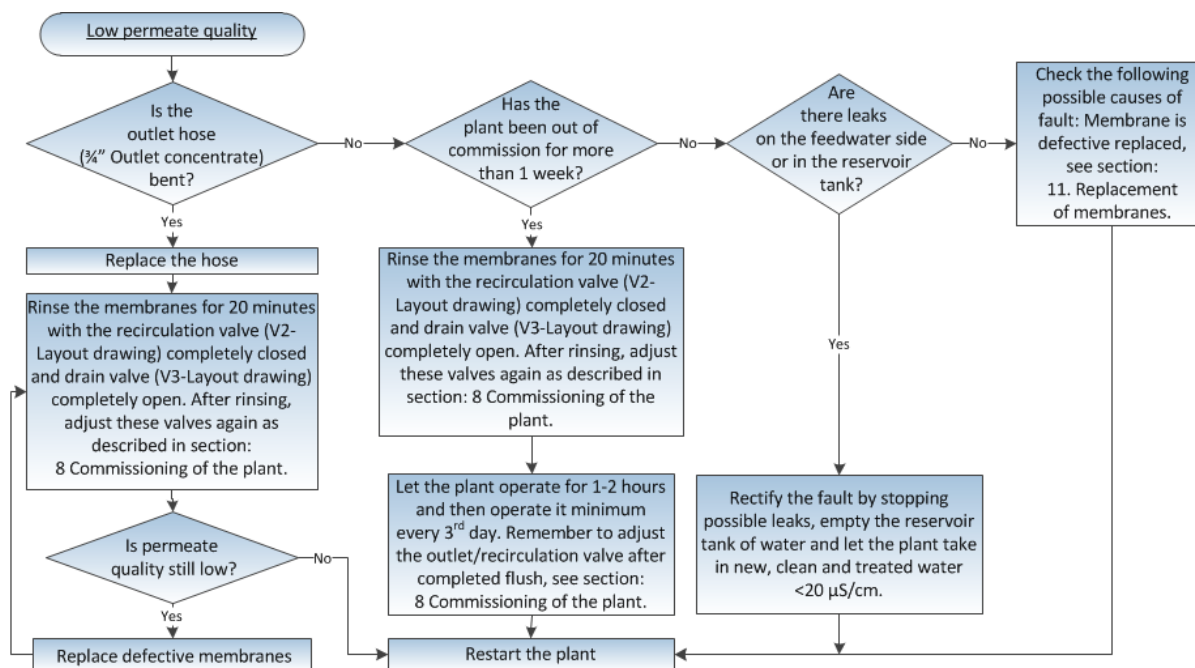


15.3 Trouble-shooting

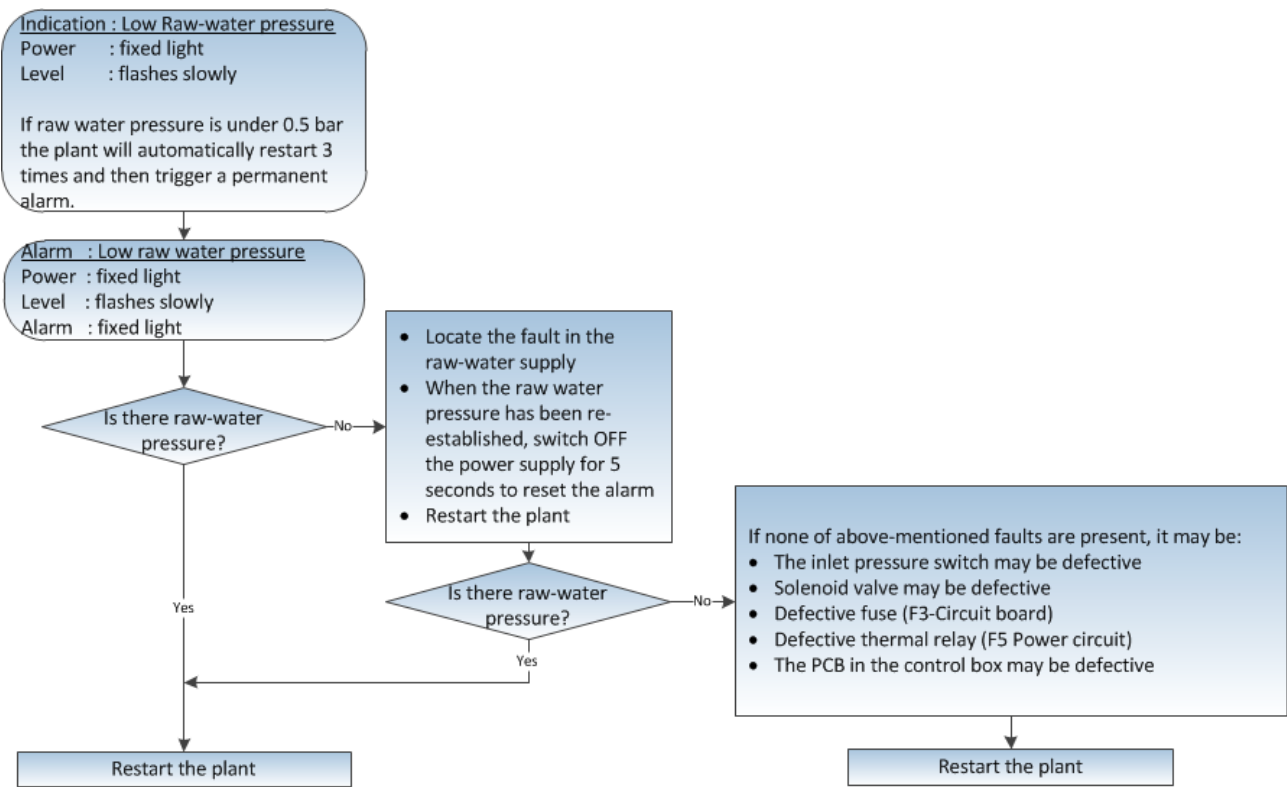
15.3.1 Plant capacity has dropped



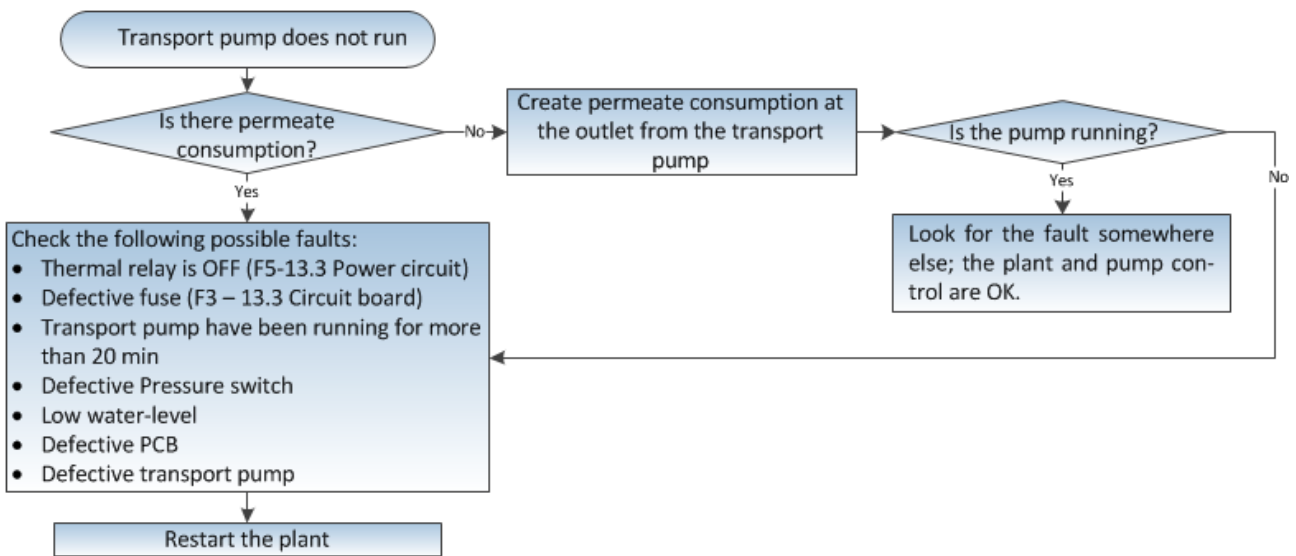
15.3.2 Treated water quality is higher than 20 μ S/cm



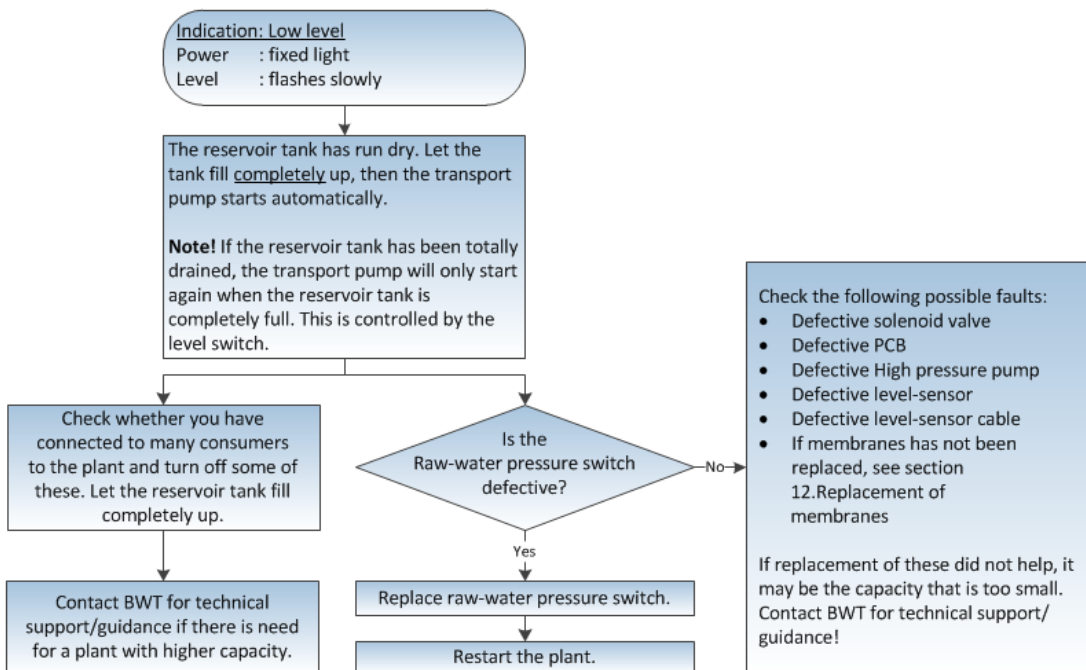
Alarm: Low raw-water pressure



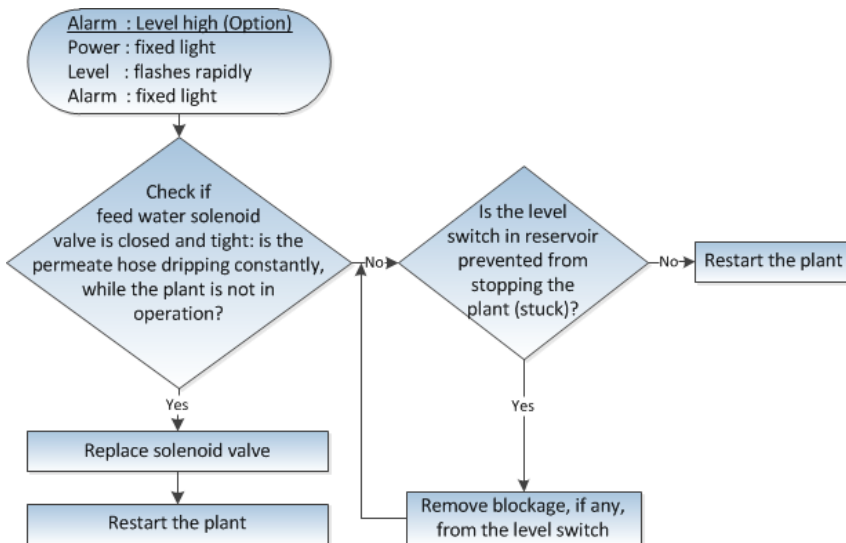
15.3.3 Alarm: Transport pump



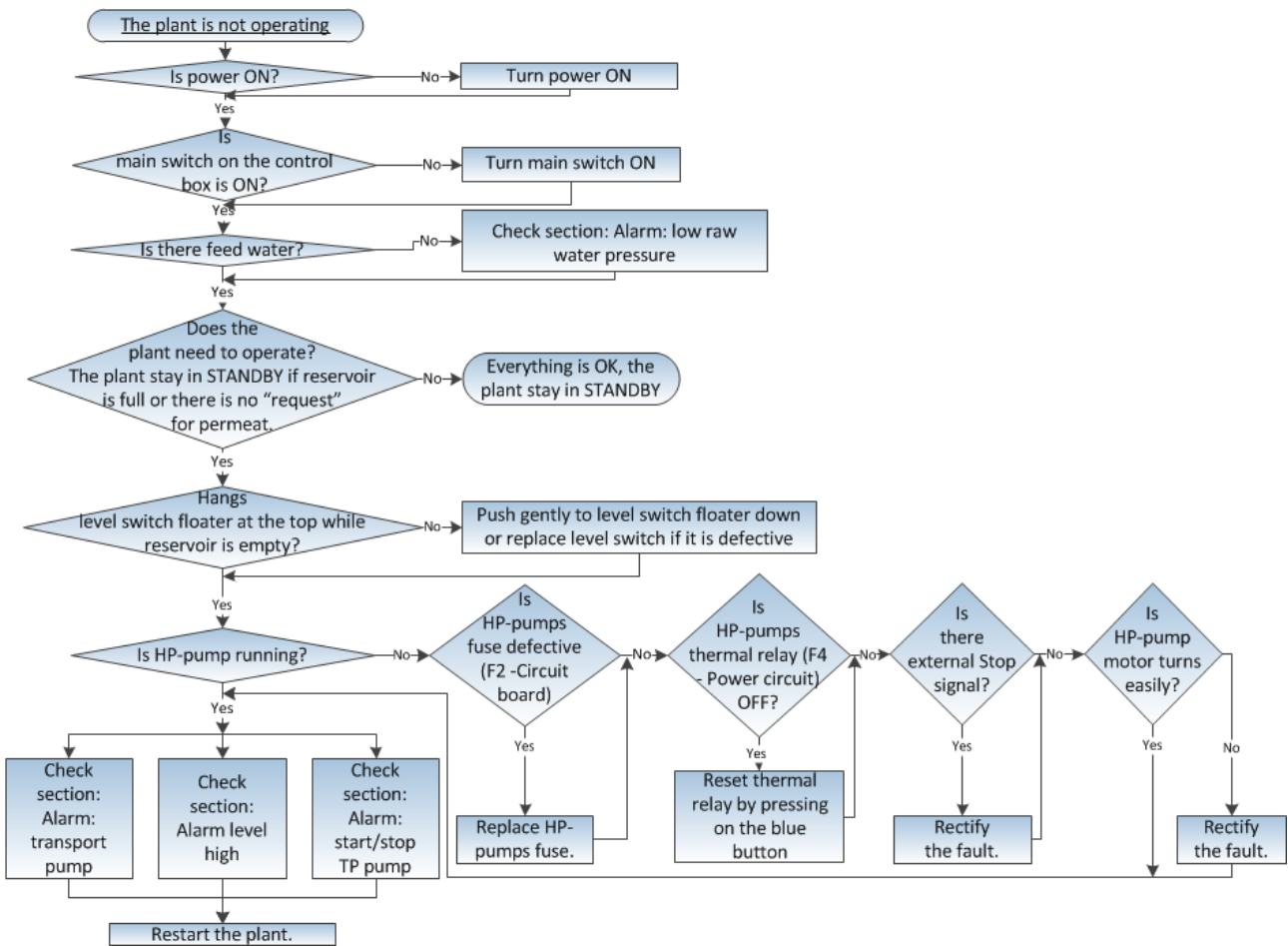
15.3.4 Indication: Level low



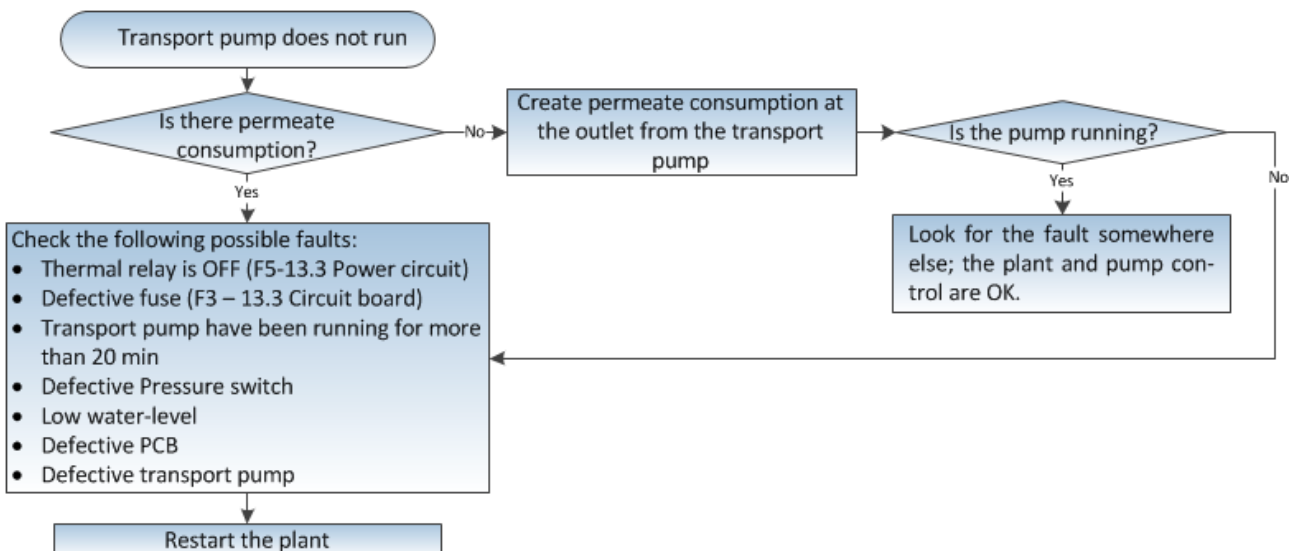
15.3.5 Alarm: level high OPTION



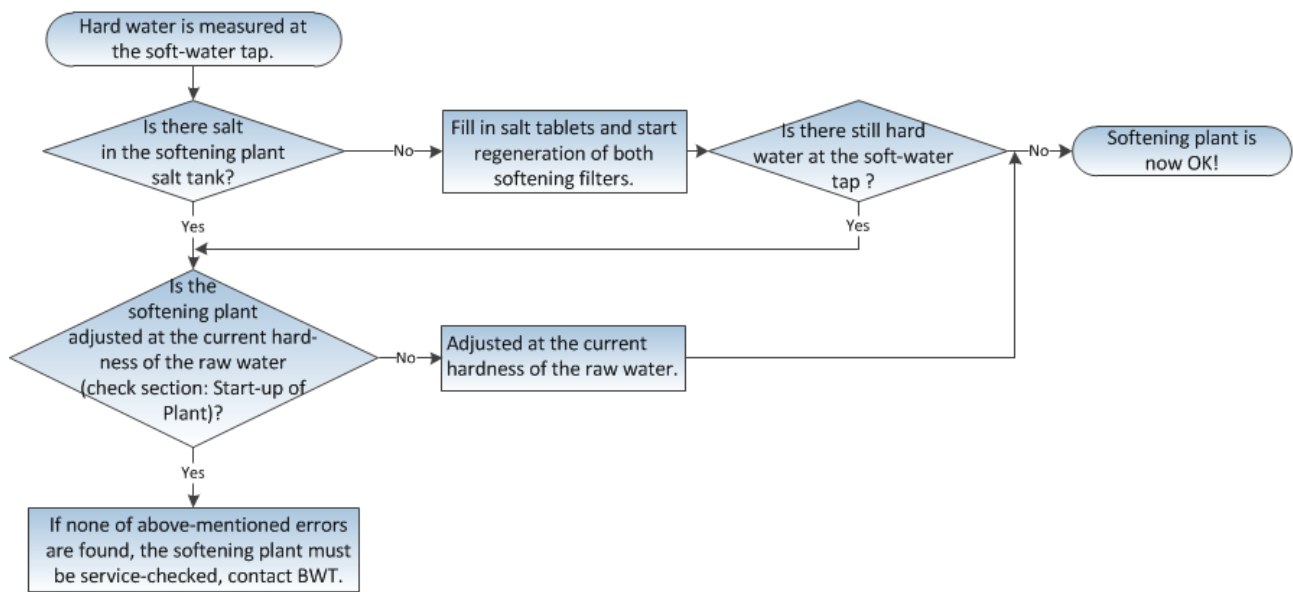
15.3.6 The plant is not operating



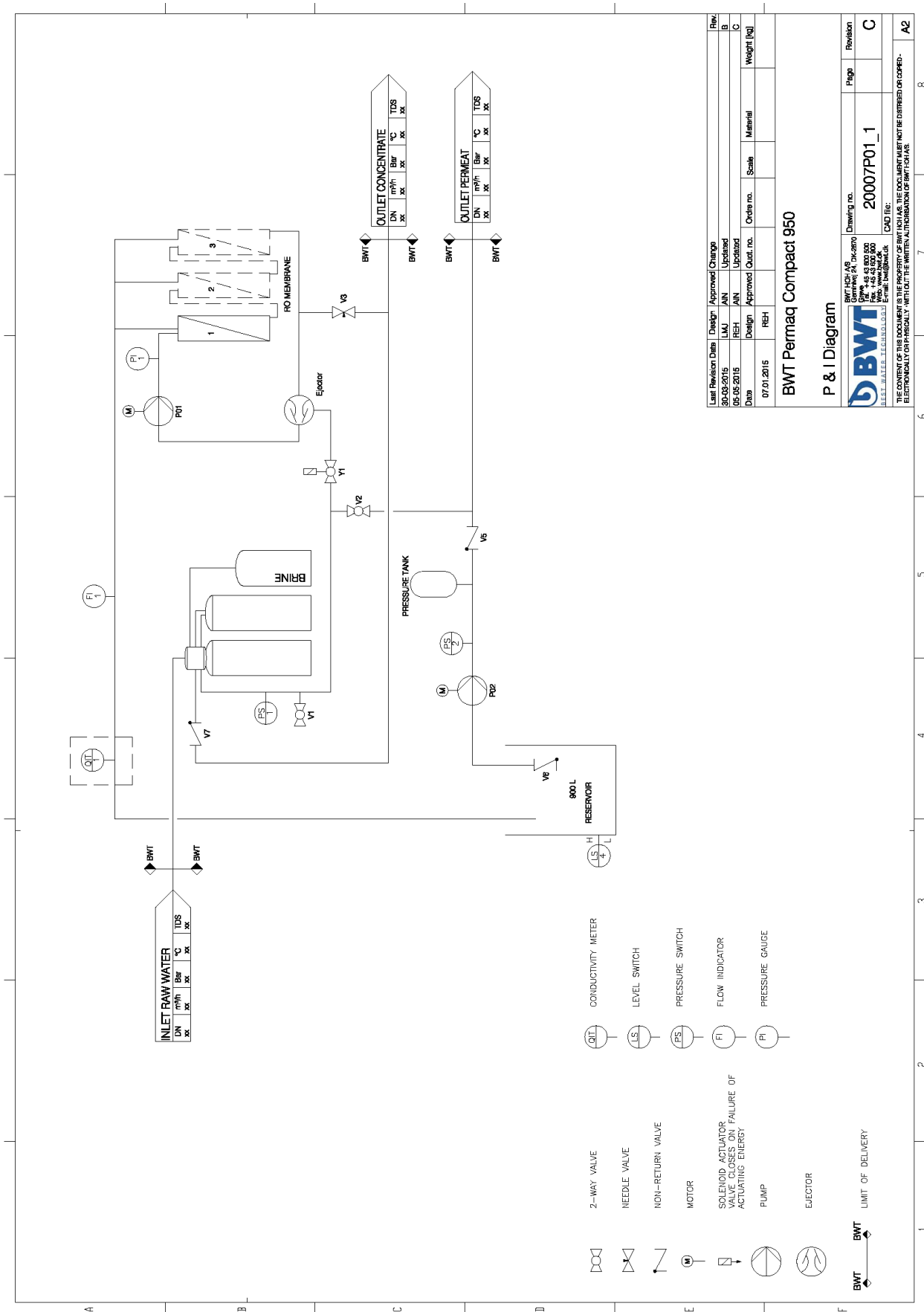
15.3.7 Alarm: The transport pump stops and starts



15.3.8 Hard water is measured at the soft-water sample valve



15.4 P&I Diagram

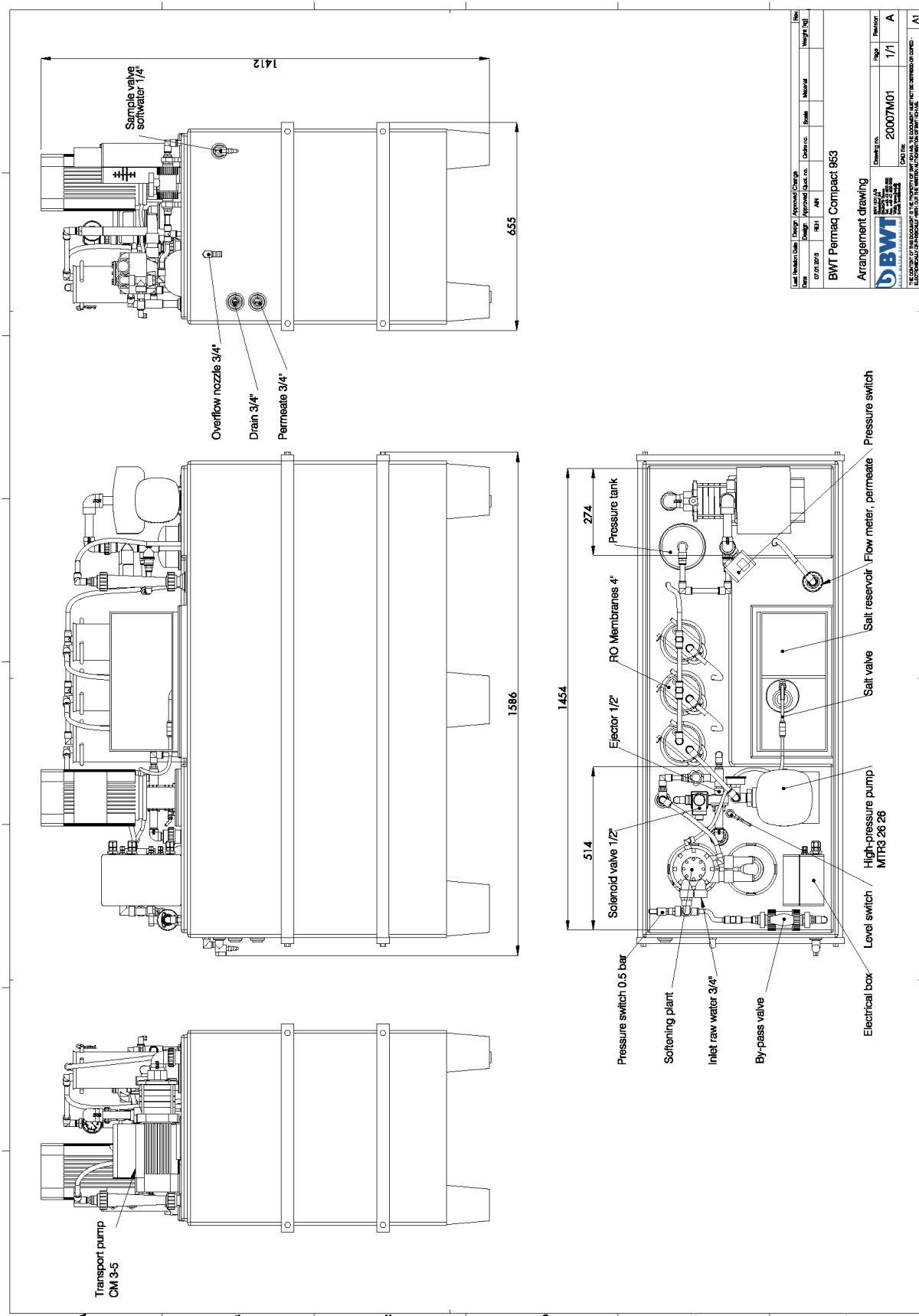


Last Revision	Date	Design	Approved	Change	Rev.
30-09-2015	LMJ	ANN	Updated		B
05-05-2015	REH	ANN	Updated		C
Data					Weight [kg]
07.01.2015	REH				

BWT Permaq Compact 950	
P & I Diagram	
BWT (S) AS Sonderweg 24 D-43009 Dorsten Tel: +49 2003 500 Fax: +49 2003 500 Web: www.bwt.com E-Mail: bwt@bwt.com	Drawing no. 20007P01_1
Page	Revision
1	C

THE CONTENT OF THIS DOCUMENT IS THE PROPERTY OF BWT (S) AS. THIS DOCUMENT MUST NOT BE REPRODUCED OR COPIED. RESPONSIBILITY FOR PROBABLY WITHOUT THE WRITTEN AUTHORIZATION OF BWT (S) AS.

15.5 Arrangement Drawing



15.6 Wiring Diagram

BWT PERMAQ COMPACT RO 950

<p>BWT BEST WATER TECHNOLOGY HOH Water Technology</p> <p>BWT HOH A/S Gæmlevvej 24 - DK-2670 Greve Tel.: +45 43 600 500 - bwt@bwt.dk - www.bwt.dk</p>	<p>Project title: BWT PERMAQ COMPACT RO 950 Page title: Frontpage File name: BWT RO 950_030615</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; border: none;">Appr.</td> <td style="border: none;"> </td> </tr> <tr> <td style="border: none;">Rev</td> <td style="border: none;">02-05-2015</td> </tr> <tr> <td style="border: none;">Dwg</td> <td style="border: none;">15-05-2015</td> </tr> <tr> <td style="border: none;">Date</td> <td style="border: none;"> </td> </tr> </table>	Appr.		Rev	02-05-2015	Dwg	15-05-2015	Date		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; border: none;">Main no.</td> <td style="border: none;">20007</td> </tr> <tr> <td style="border: none;">Draw. no.</td> <td style="border: none;">20007E01_B</td> </tr> </table> <p style="text-align: right; font-size: small;">Next page: Cont Page no. F</p>	Main no.	20007	Draw. no.	20007E01_B
Appr.														
Rev	02-05-2015													
Dwg	15-05-2015													
Date														
Main no.	20007													
Draw. no.	20007E01_B													

Pos.	Title	Revision	Page no.
1	IEC EN 60757 - Wire colours and no. in BWT panels		Info
2	Layout		Layout
3	Power supply		1
4	Electrical connections		2
5	Circuit board		3
6	Komponentliste		4
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			


Project title: BWT PERMIO COMPACTRO 960		Main no. 20007		Page no. Cont	
Page title: table of contents		Rev 04-06-2015		MPI	
File name: BWTRO960_030615		Dwr 15-05-2015		MPI	
		Date		Ass. / Appr.	
				Previous page: F	
				Next page: Info	

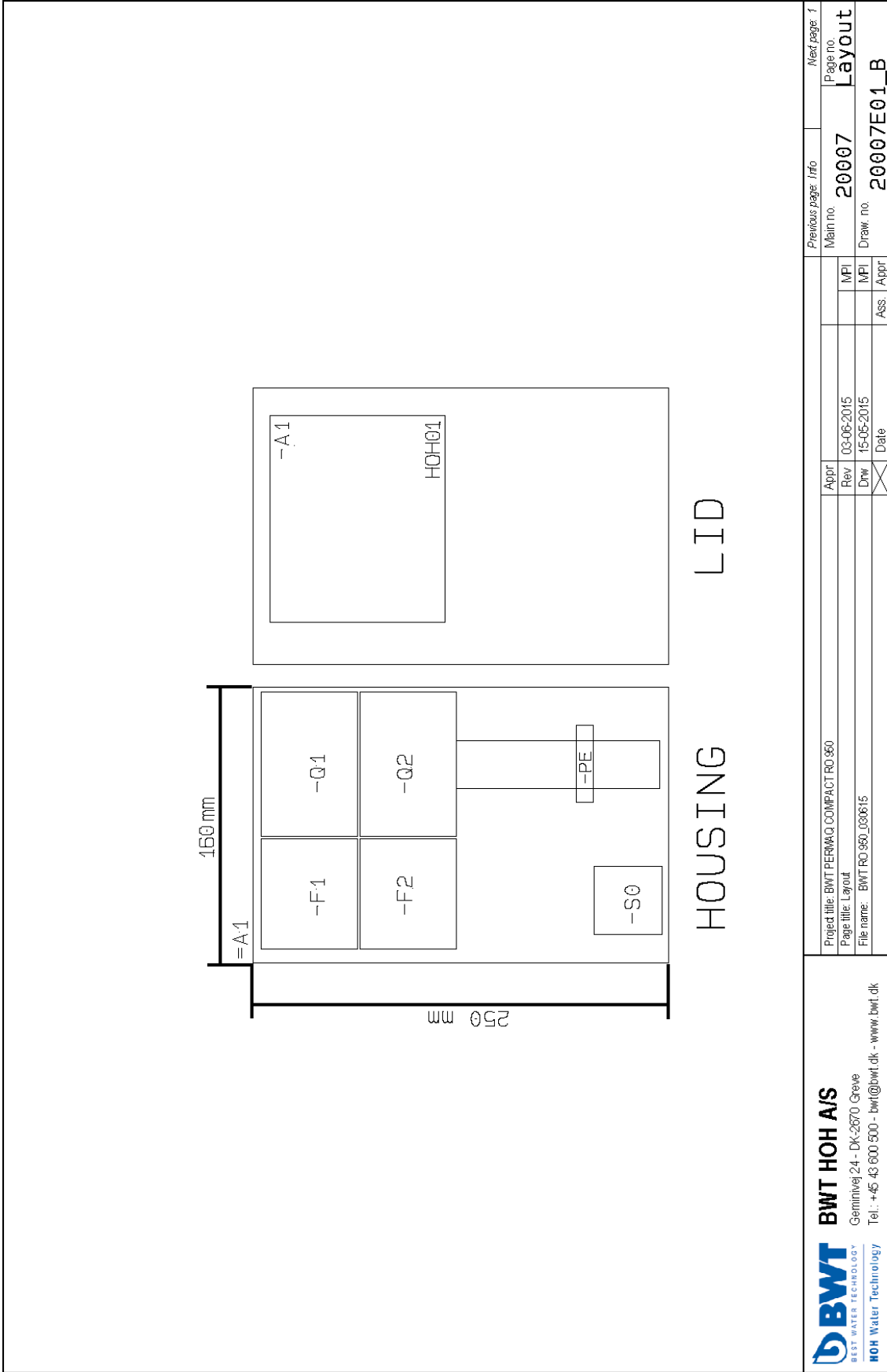

BWT HOH A/S
 BEST WATER TECHNOLOGY
 HOH Water Technology
 Gernitvej 24 - DK-2670 Greve
 Tel.: +45 43 600 500 - bwt@bwt.dk - www.bwt.dk

IEC/EN 60757 BWT HOH		UK		DK	
1	BK	Black	Sort		
6	BN	Brown	Brun		
12	RD	Red	Rød		
	OG	Orange	Orange		
	YE	Yellow	Gul		
5	GN	Green	Grøn		
2	BU	Blue/Dark blue	Blå		
8	VT	Light blue	Lyseblå		
4	GY	Violet	Violet		
7	WH	Gray	Grå		
9	PK	White	Hvid		
GO	PK	Pink	Pink		
TO	GO	Gold	Guld		
SR	TO	Turquoise	Turkis		
3	GNVE	Silver	Sølv		
		Green/Yellow	Grøn/Gul		

Wire no.	Colour	Main power min. 1.5mm ² /500VAC	Control current wire 0.75mm ² /500V-0.5mm ² /300V
1	BK-Black	PVT 90	L1/U
1	BK-Black	PVT 90	L2/V
1	BK-Black	PVT 90	L3/W
2	BU-Light blue	N	
3	GNVE-Green/Yellow	PE	
6	RD-Red		L Phase
2	BU-Light blue		N
12	OG-Orange		External supplied wires

Wire no.	Colour	Control current wire 0.75mm ² /500V-0.5mm ² /300V	Wires in measuring circuit, foreign voltage ect.
4	GY-Gray	L+ / VDC+	
5	BU-Dark blue	L- / VDC-	
9	PK-Pink	Connection wire	
21	WHYE-White/Yellow	-	Connection wire
22	WHRD-White/Red	-	Connection wire
23	WHGY-White/Gray	-	Connection wire
24	WHBU-White/Blue	-	Connection wire
25	WHBN-White/Brown	-	Connection wire
26	WHGN-White/Green	-	Connection wire
27	WHBK-White/Black	-	Connection wire
28	WHVT-White/Violet	-	Connection wire
29	WHOG-White/Orange	-	Connection wire
30	YERD-Yellow/Red	-	Connection wire
31	YEGY-Yellow/Gray	-	Connection wire
32	YEBU-Yellow/Blue	-	Connection wire
33	YEBN-Yellow/Brown	-	Connection wire
34	YEBK-Yellow/Black	-	Connection wire
35	ROBU-Red/Blue	-	Connection wire
36	ROGN-Red/Green	-	Connection wire
37	ROBK-Red/Black	-	Connection wire
38	GYRD-Gray/Red	-	Connection wire
39	GYBU-Gray/Blue	-	Connection wire
40	GYBN-Gray/Brown	-	Connection wire
41	GYGN-Gray/Green	-	Connection wire
42	GYBK-Gray/Black	-	Connection wire
43	BUGN-Blue/Green	-	Connection wire
44	BUBK-Blue/Black	-	Connection wire
45	BNRD-Brown/Red	-	Connection wire
46	BNBU-Brown/Blue	-	Connection wire
47	BNGN-Brown/Green	-	Connection wire
48	BNBK-Brown/Black	-	Connection wire
49	GNBK-Green/Black	-	Connection wire

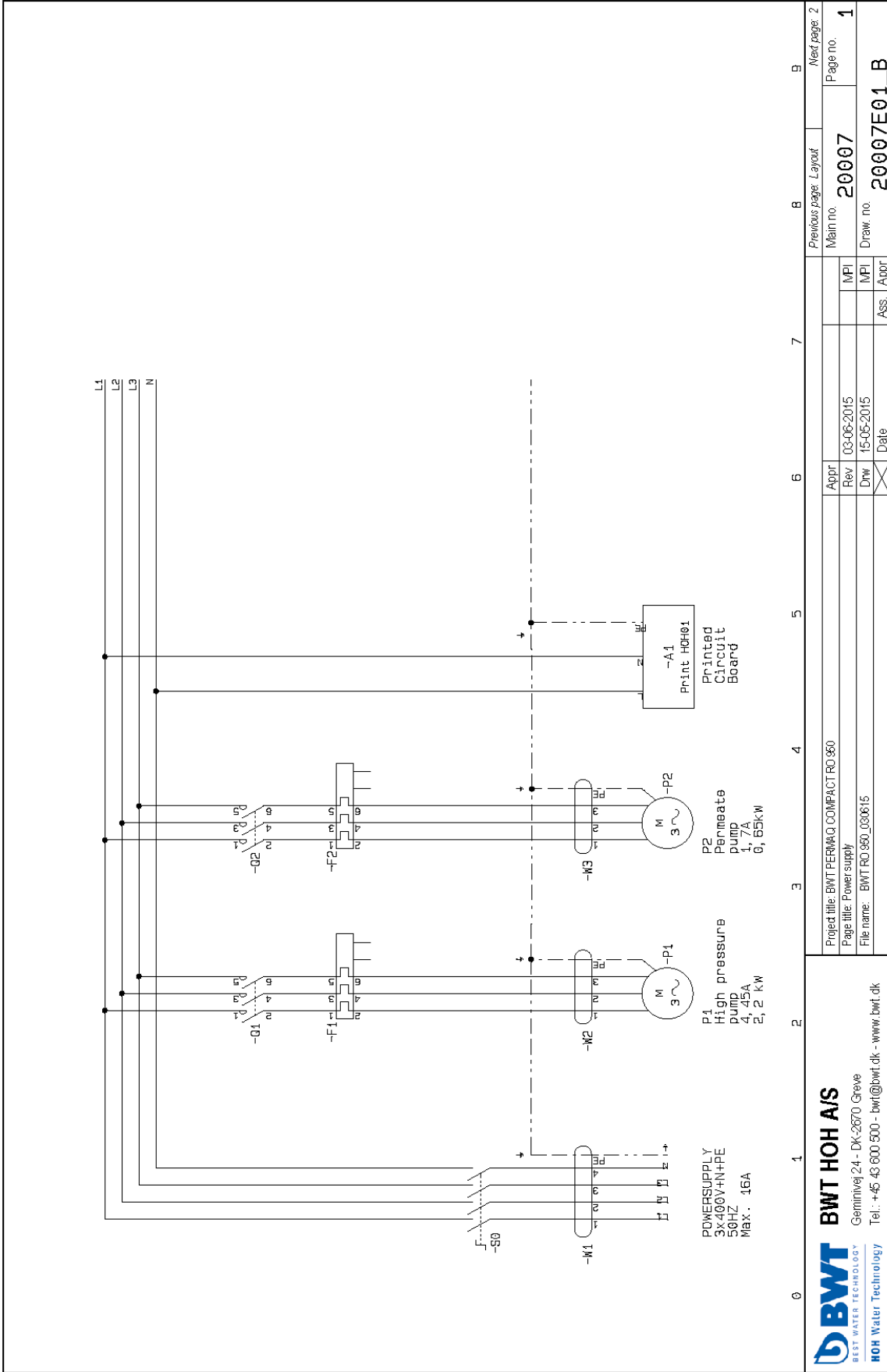
 BWT HOH AIS Gerningevej 24 - DK-2670 Greve Tel: +45 43 600 500 - bwt@bwt.dk - www.bwt.dk		Project title: BWT PERMAQ COMPACT RO 360 Page title: IEC/EN 60757 - Wire colours and no. in BWT panels File name: BWT RO 360_030615	Previous page: Cont Main no: 20007 Draw no: 20007E01_B	Next page: Layout Page no: Info
Approved: <input type="checkbox"/>	Rev: 20-03-2015 Date: 15-05-2015	MPI	Ass:	MPI



Project title: BWT PERMACO COMPACT RO 960		Appr.		Previous page: Info		Next page: 1	
Page title: Layout		Rev: 03-06-2015		Main no: 20007		Page no: Layout	
File name: BWT RO 960_030615		Date: 15-05-2015		Draw. no: 20007E01_B			
		Drw: MPI		Ass: MPI		Appr: MPI	


BWT HOH AIS
 Gemmivej 24 - DK-2670 Greve
 Tel.: +45 43 600 500 - bwt@bwt.dk - www.bwt.dk

HOH Water Technology



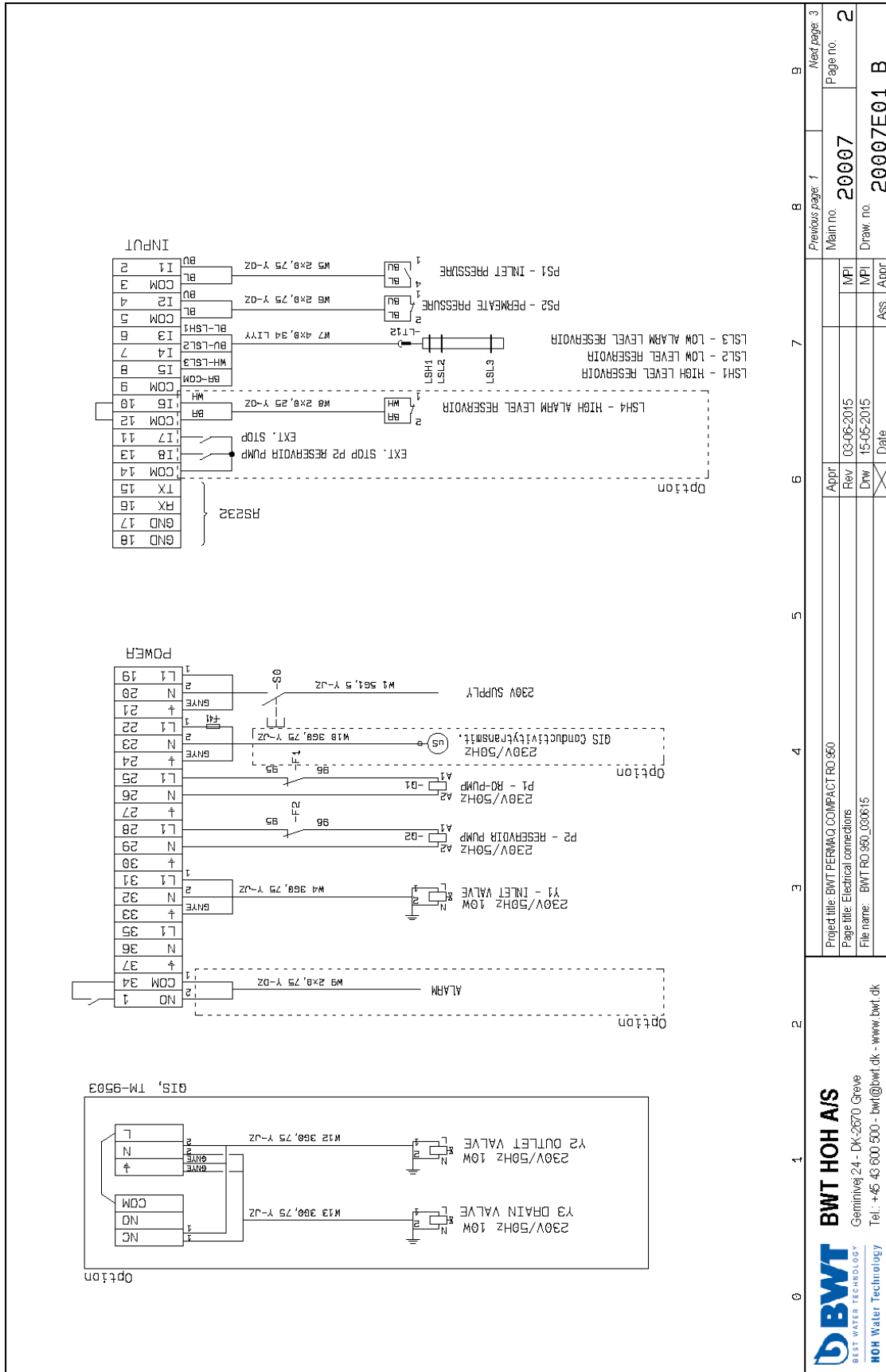
0	1	2	3	4	5	6	7	8	9
Project title: BWT PERMAG COMPACT RO 960		Appr		Main no. 20007		Previous page: Layout		Next page: 2	
Page title: Power supply		Rev 03-06-2015		Draw no. 20007E01_B		Date 15-05-2015		Page no. 1	
File name: BWT RO 960_030615		Dwg		Ass		MPI		Appr	

Project title: BWT PERMAG COMPACT RO 960		Appr		Main no. 20007		Previous page: Layout		Next page: 2	
Page title: Power supply		Rev 03-06-2015		Draw no. 20007E01_B		Date 15-05-2015		Page no. 1	
File name: BWT RO 960_030615		Dwg		Ass		MPI		Appr	

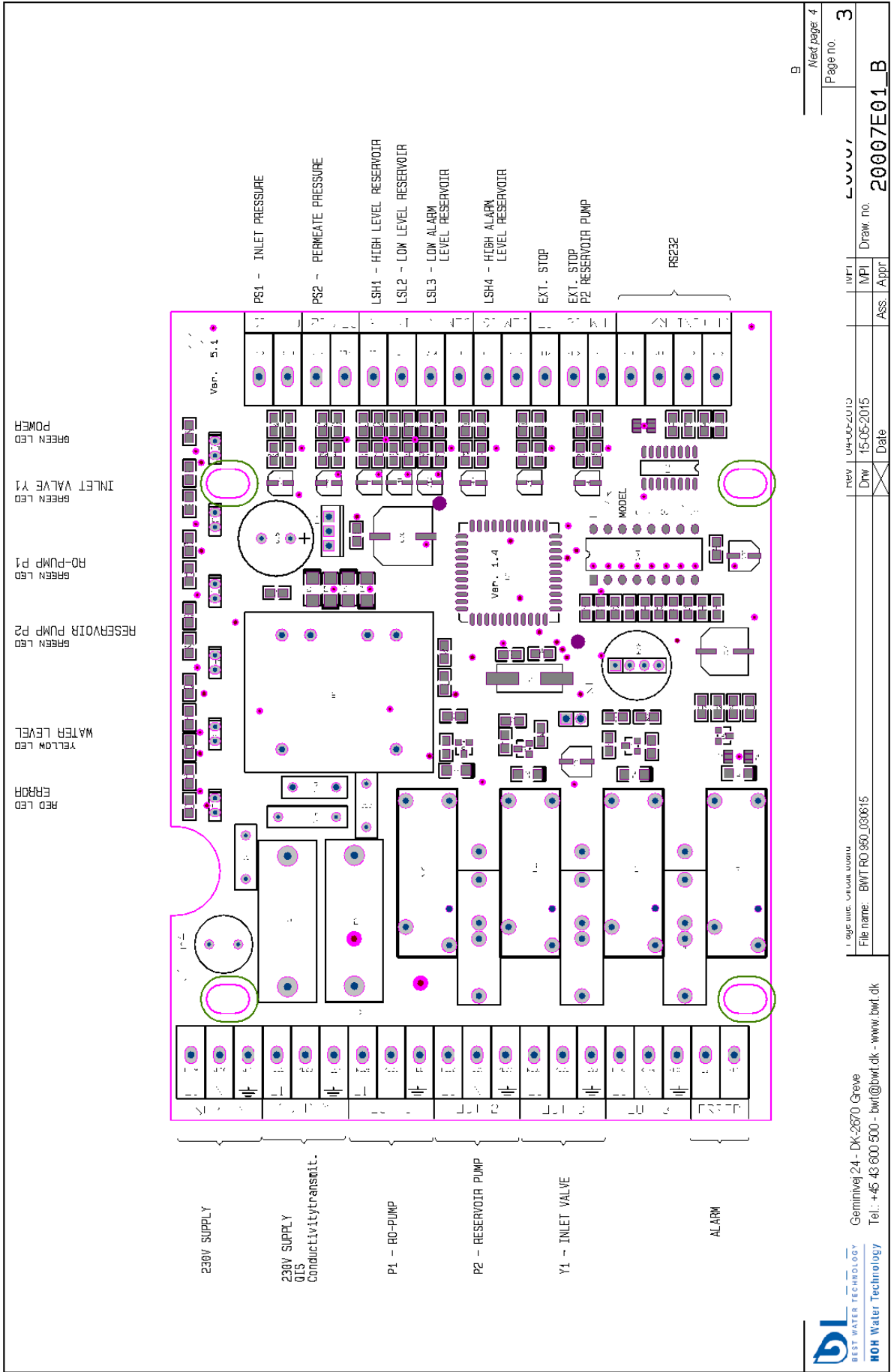
BWT
BEST WATER TECHNOLOGY

HOH Water Technology

BWT HOH AIS
Gertinevej 24 - DK-2670 Greve
Tel.: +45 43 600 500 - bwt@bwt.dk - www.bwt.dk



0	BWT HOH A/S BEST WATER TECHNOLOGY HOH Water Technology Geminivej 24 - DK-2670 Greve Tel.: +45 43 600 500 - bwt@bwt.dk - www.bwt.dk		Project title: BWT PERMIA Q COMPACT RO 960 Page title: Electrical connections File name: BWT RO 960_030615	Appr. _____ Rev 03-06-2015 Dnw 15-05-2015 Date	Main no. 20007 MPI MPI Ass. MPI Appr. MPI	Previous page: 1 Next page: 3 Page no. 2
1						
2						
3						
4						
5						
6						
7						
8						
9						



15.7 Start-up test

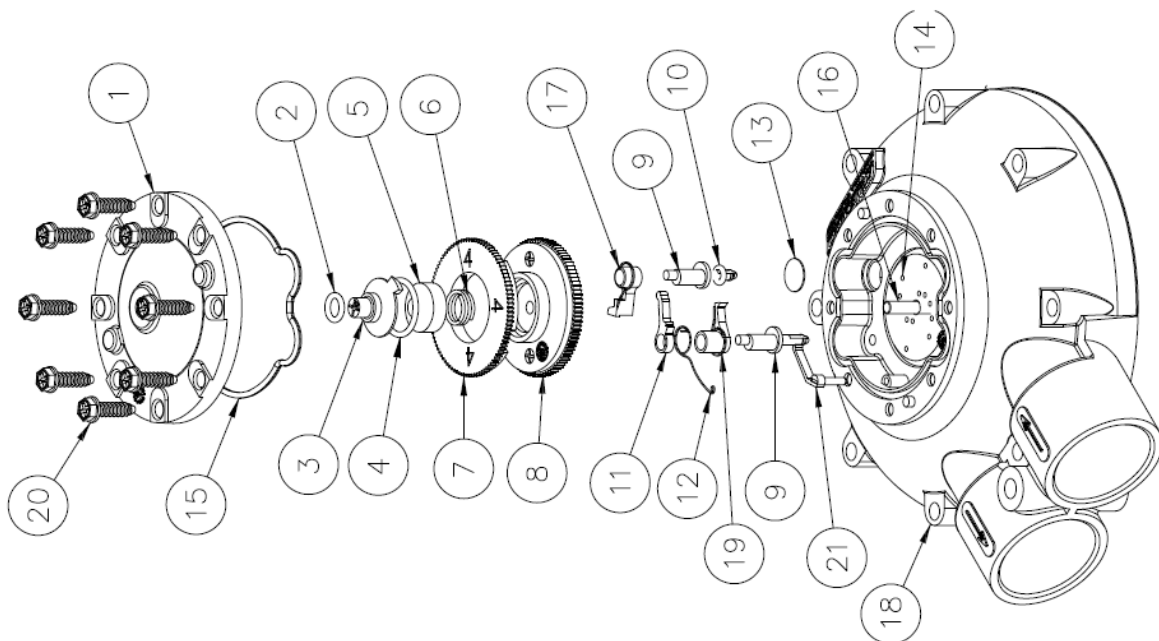
Start-up test			
The start-up test sheet must be completed and filed together with the operating journal.			
Name of customer:		Plant number:	Work-sheet number:
Test of raw water			
Temperature [°C]:	Conductivity [μ S/cm]:	Hardness [°dH]:	Inlet pressure [bar]
Softening unit			
Type of plant:		Hardness [°dH] after softening:	
Tick if "yes":			
<input type="checkbox"/> Time-controlled	<input type="checkbox"/> Quantity-controlled	<input type="checkbox"/> Dimensioned correctly for RO	
<input type="checkbox"/> New	<input type="checkbox"/> Used	<input type="checkbox"/> Plant and salt valve set at the correct hardness	
RO-plant			
Type of plant:	Raw-water pressure [bar]:	Outlet pressure, high-pressure pump [bar]:	Recirculation flow [l/h]:
Permeate flow [l/h]:	Concentrate flow [l/h]	Outlet pressure, permeate [bar]:	Conductivity, permeate [μ S/cm]:
<input type="checkbox"/> Inlet pressure switch is OK <input type="checkbox"/> Direction, high-pressure pump is OK <input type="checkbox"/> Level switch, start/stop of high-pressure pump is OK			
Permeate tank			
<input type="checkbox"/> Pre-pressured pressure tank 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	
Status on start-up			
<input type="checkbox"/> Start-up by BWT		<input type="checkbox"/> Start-up by dealer, specify dealer: _____	
Problems on start-up			
<input type="checkbox"/> Yes, there were problems at start-up		<input type="checkbox"/> No, there were no problems at start-up	
In case of problems, please fill in the problem report			
Problem report			
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 of problem:			

Signature			
Name/initials of technician:		Date:	Time consumption for the start-up [hours]

15.9 Spare parts

15.9.1 Spare parts softening plant

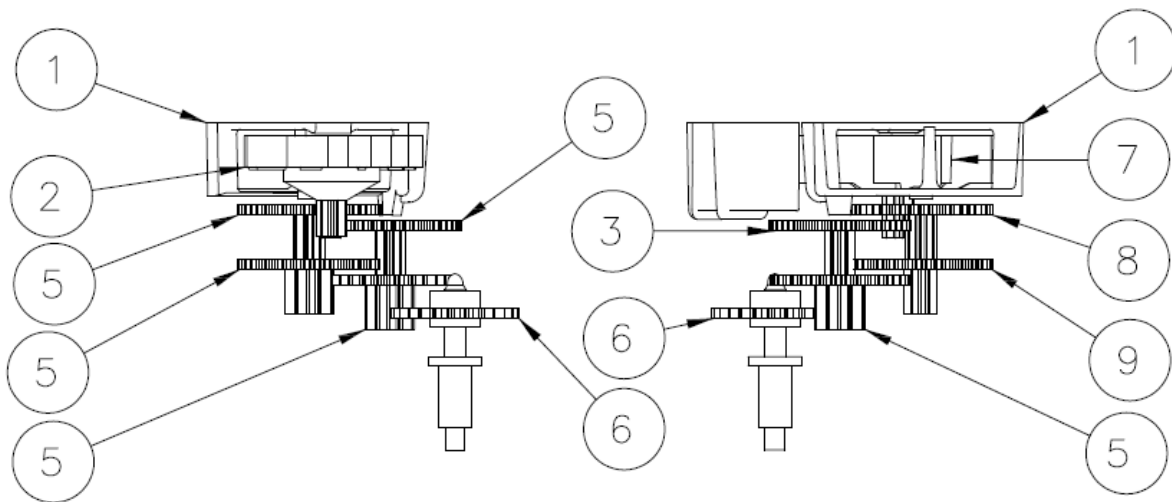
Item	Article Number	Description	Qty.
1	405390440	Cap, D.O.	1
2	405314600	O-ring actuator	1
3	405392840	Actuator with indication	1
4	405310700	Balance piston O-ring	1
5	405392600	Balance piston	1
6	405354480	Spring balance piston	1
7	405315070	Meter disc no. 4	1
8a	405347010	Spring, meter drive pawl	1
8b	405346890	Control disc	1
9	(1520)	Pin, Eccentric drive, snap-fit	2
10	(2657)	O-ring, 6-CBRV, RO, Stem gear	1
11	405370140	Pawl, meter drive	1
12	405370100	Spring, meter drive pawl	1
13	405310781	Filtre micron level 1	1
14	(1008)	Ceramic disc	1
15	405386280	Cap seal	1
16	(1023)	Support pin	1
17	405317830	Pawl, reg. start	1
18	(5243)	L-1, asy	1
19	405355110	Pawl, Reg. drive	1
20	405310100	Cap screw	1
21	405370970	Pawl, No back	1



Item	Article Number	Description	Qty.
1	(11902)	Gear, Alignment clip	2
2	405316710	Turbine 10 – reg. (VKI)	1
3	405315260	Gear no. 5	1
4	405315240	Gear no. 3	1
5	405315230	Gear no. 2	1
6	(1521)	Gear - Stem	1
7	405392580	Turbine 9	1
8	405315250	Gear no. 4	1
9	405315220	Gear no. 1	1

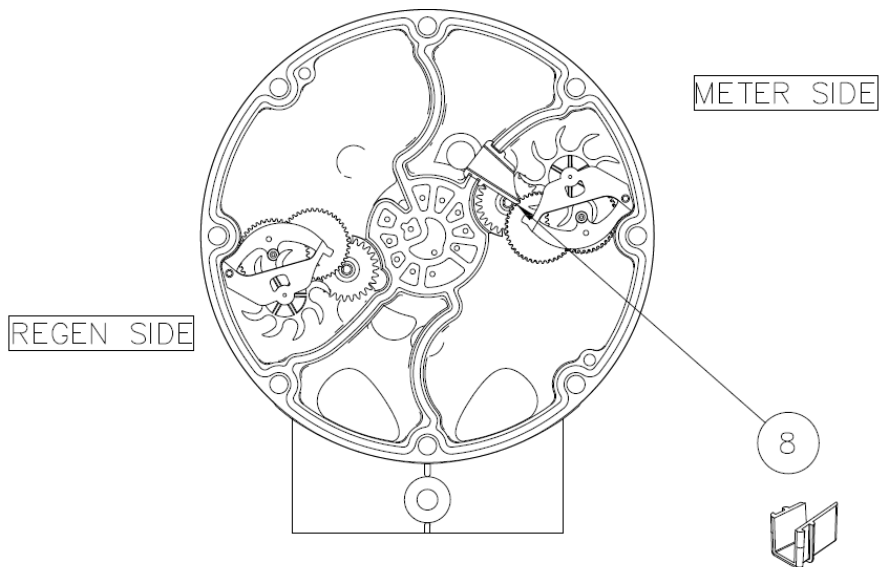
Note:

Item 2, 3, 4, 5, 7, 8 and 9 are model specific items



REGEN SIDE

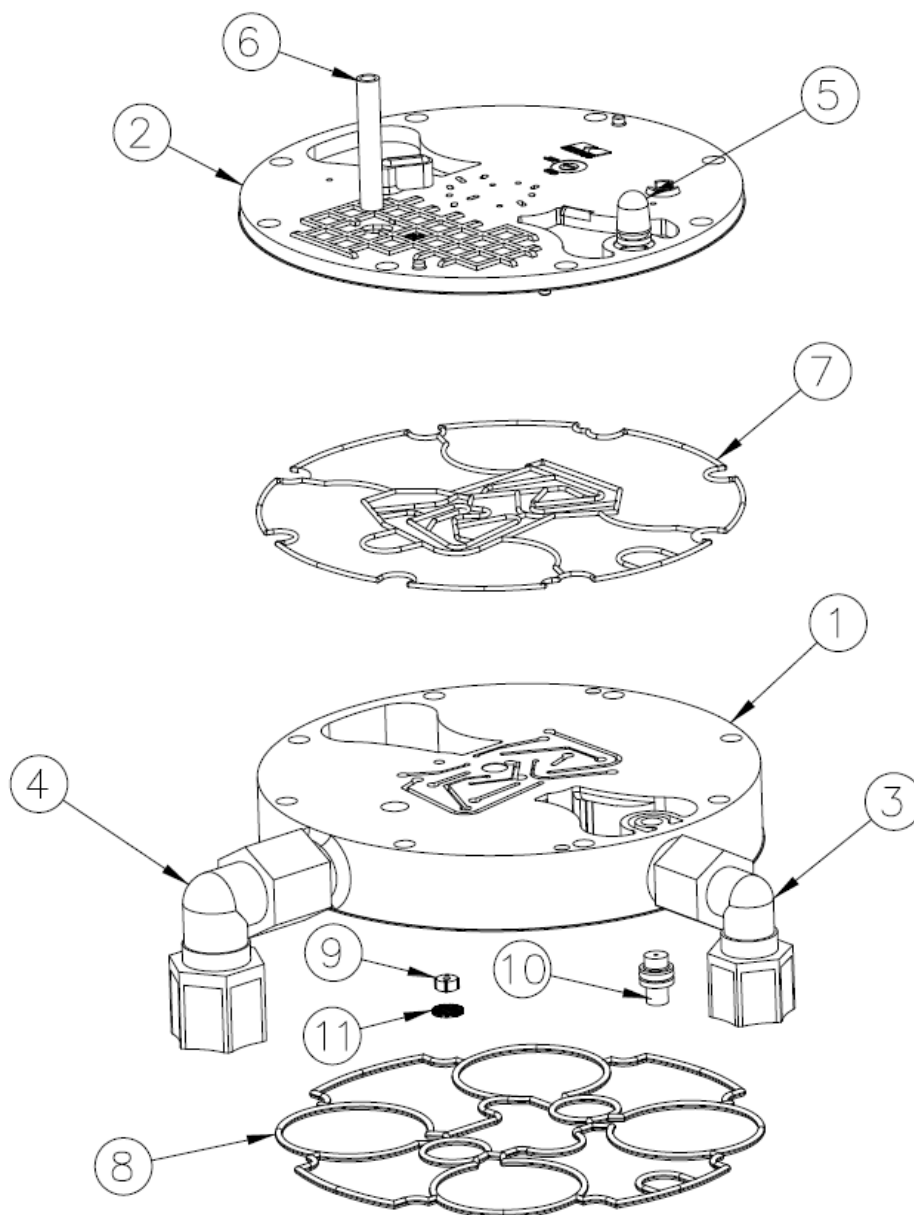
METER SIDE



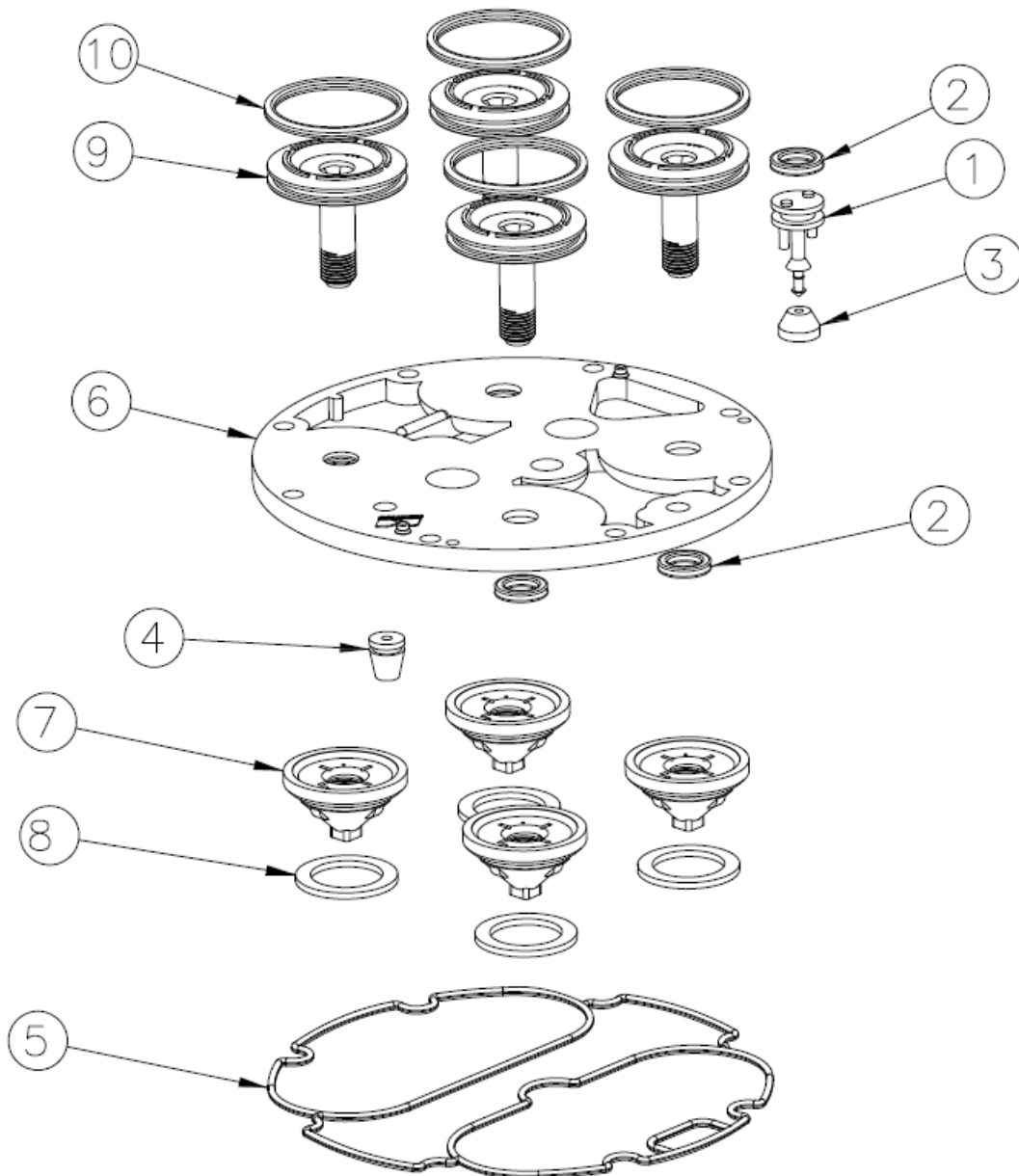
REGEN SIDE

METER SIDE

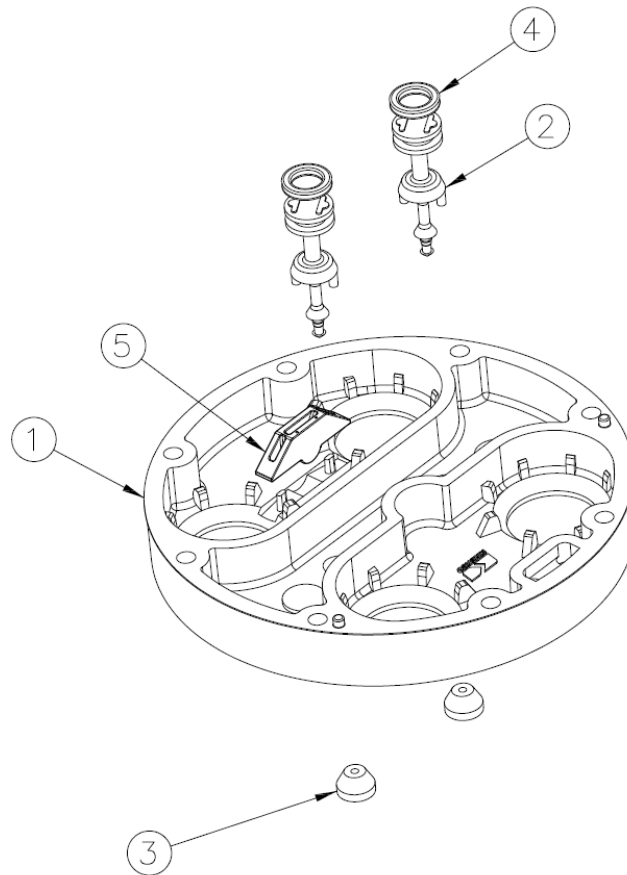
Item	Article Number	Description	Qty.
1	(8915C)	L-3 STD-HT, 3/8 DRN	1
2	405372250	Level 2	1
3	405318400	Brine elbow	1
4	405318500	Drain elbow	1
5	405351560	Flow control (venture 0,4)	1
6	405314800	Vent tube	1
7	405386300	Seal (Level 2)	1
8	405386310	Seal (level 2-3)	1
9	405365870	Flow control regen. 0,4 (level 3)	1
10	405310430	Venturi throat-white	1
11	(11017)	Screen-filter level 3	1



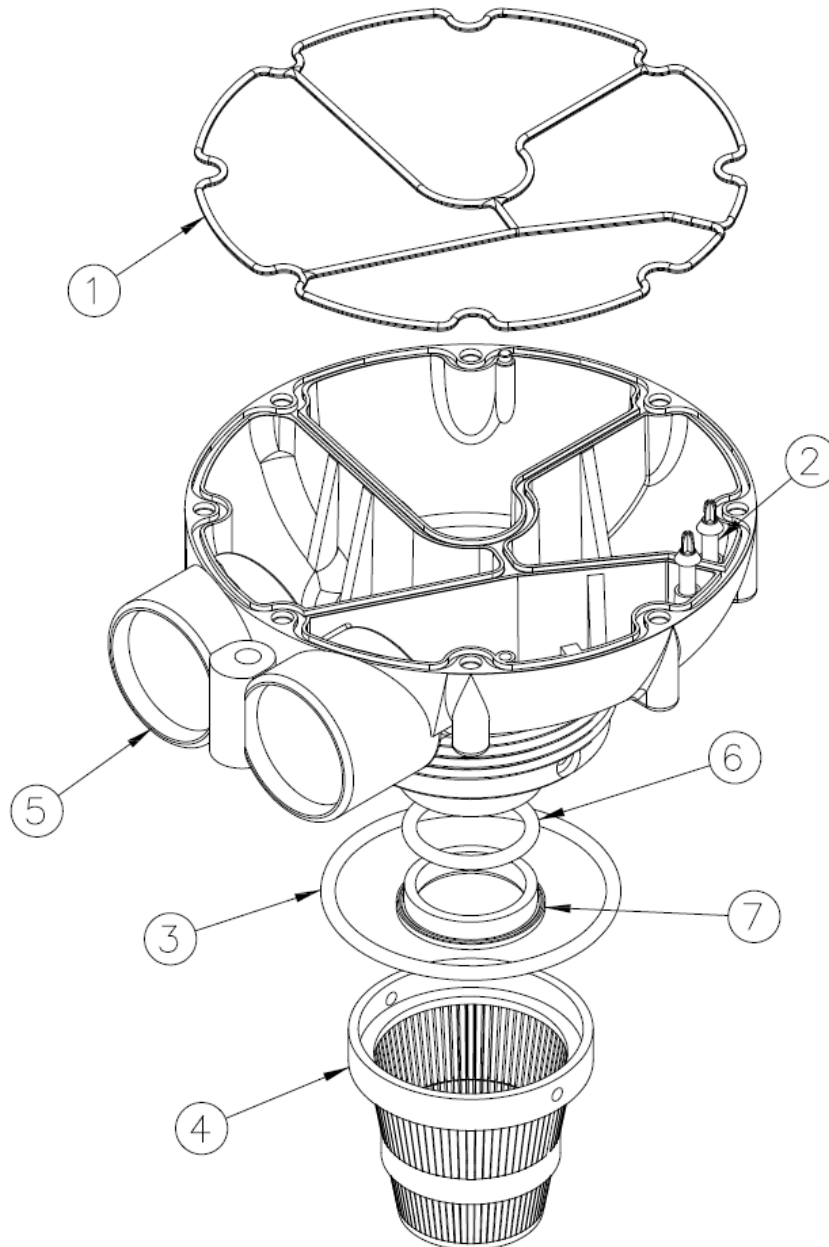
Item	Article Number	Description	Qty.
1	405378680	Control valve w/quad (HT)	1
2	405315900	Quad ring (drain & cont)	5
3	405378690	Seal, drain/control valve	1
4	405310530	Flow control – 1,4 GPM	1
5	405386320	Seal (level 4)	1
6	405352480	Level 4 – w/all retainers	1
7	405352520	Main valve seat	4
8	405378650	Seal-main valve seat	4
9	405352510	Main valve piston	4
10	405315500	Seal-main valve piston	4



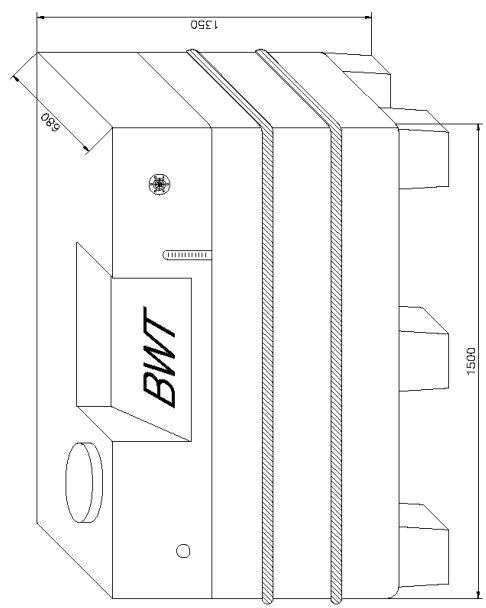
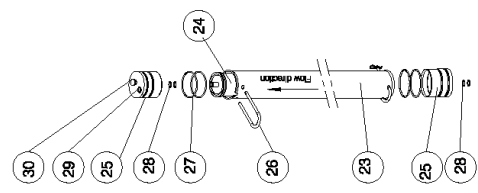
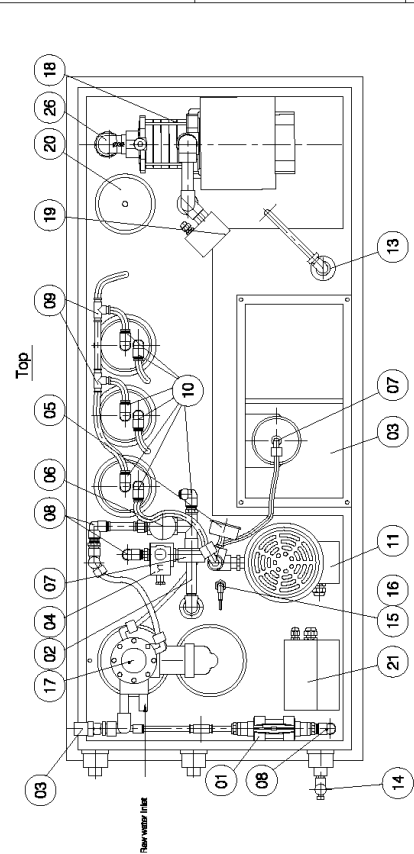
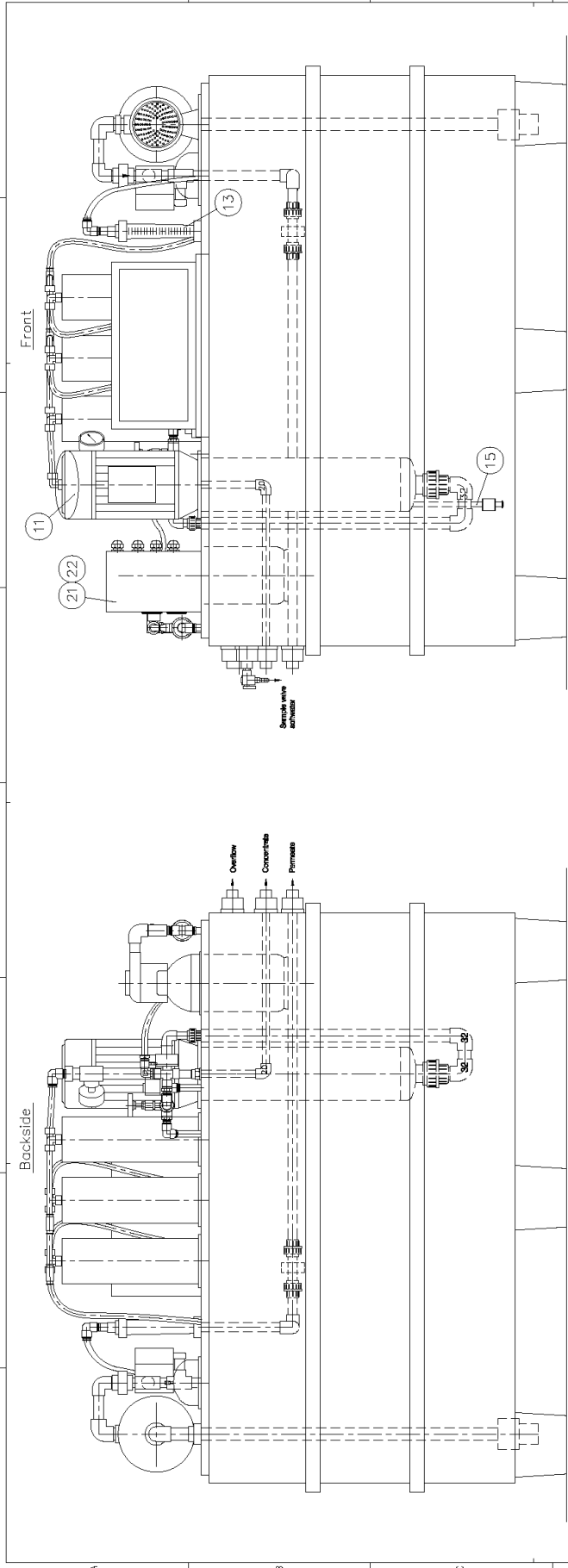
Item	Article Number	Description	Qty.
1	405378741	Level 5 w/check seal only	1
2	405378720	Drain valve	2
3	405378690	Seal, drain/control valve	2
4	405315900	Quad ring (drain & cont)	2
5	405392610	interlock	1



Item	Article Number	Description	Qty.
1	405386330	Seal, main base – SK/HT	1
2	405386270	Stem 6654 to HT	2
3	405389250	O-ring (base)	1
4	405328380	Distributor, Upper, Fint/HT	1
5	405352601	Base, main stem reverse	1
6	405318000	O-ring (dist. Tube)	1
7	(5261A)	Retainer (dist. Tube)	1



Item no.	Description	Recommended spare parts	Part no.	Recommended replacement frequency
01	By-pass valve	1	200712025	
02	Ejector		452575000	
03	Safety pressure switch 0,5 bar	1	452550005	
04	Solenoid valve ½"	1	200752004	
05	Manometer 0 – 40 bar	1	452266000	
06	½" needle valve with counter nuts	1	200731004	
07	Salt valve		405378050	
08	Snap-on connector 14mm elbow	8	454090014	3 years
09	T-snap-on connector 14mm		454095014	3 years
10	Snap-on connector 14mm ½" elbow	2	454090013	3 years
11	High-pressure pump MTR3-26/26		454100660	
12				
13	Flowmeter, permeate		453012016	
14	Sample valve – soft water		200721020	
15	Level sensor		451404420	
16	Cable for level sensor		451404460	
17	Complete softening plant		451404085	
18	Reservoir pump		454100720	
19	Danfoss pressure switch type KPI 0,2 – 8 bar		451202802	
20	Pressure tank 2.0 l		451404570	3 – 5 years
21	Control box complete		451404812	
22	Electrical print (PCB)		506708233	
23	Pressure tube		451404069	
24	Membrane	1 – 3	451404038	1 year
25	End cap	2 – 6	451404112	3 years
26	U-lock	2 – 6	451404090	
27	O-ring large (outside)	4 – 12	451404211	3 years
28	O-ring small (inside)	4 – 12	451404215	3 years
29	Threaded ring	2 – 6	016211133	3 years
30	Plug	1 – 3	454090014	



Last Revision	Code	Design	Approved	Change	Date	Weight (kg)
07/01/2019	REV1	REV1	REV1	REV1	REV1	REV1

BWT Permaq Compact 963

Spares parts drawing

 BWT BAWA S.p.A. - LEGNANOVA (PV) - ITALY Tel: +39 039 960000 Fax: +39 039 960001 E-mail: bwt@bwt.com Web: www.bwt.com	Drawing No. 2007001-1	Page A	Revision A
--	---------------------------------	------------------	----------------------

IN CONFORMITY WITH ISO 9001:2015 CERTIFICATION, THE COMPANY ASSURES THE ACCURACY OF THE INFORMATION CONTAINED IN THIS DRAWING. THE INFORMATION IS PROVIDED AS IS, WITHOUT WARRANTY OF ANY KIND, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

15.10 Declaration of Conformity

**EC Declaration of Conformity
For Machinery Directive 2006/427/EC, Annex II, A
Low Voltage Directive
EMC Directive**



BWT HOH A/S

Geminivej 24 – DK-2670 Greve

Tel.: +45 43 600 500 – fax: +45 43 600 900

bwt@bwt.dk – www.bwt.dk

Herewith declares that:

BWT PERMAQ Compact 951-S, 952-S and 953-S

- 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/EEC)
- EMC Directive (2004/108/EEC)

- Place: Greve, Denmark
- Date: 01-04-2015

Lars Jensen

Head of Product Management



Further information:

BWT HOH A/S
Geminivej 24
DK-2670 Greve
Tel : +45 43 600 500
Fax: +45 43 600 900
E-Mail: bwt@bwt.dk

BWT Birger Christensen AS
Røykenveien 142 A
Postboks 136
N-1371 Asker
Tel : +47 67 17 70 00
Fax: +47 67 17 70 01
E-Mail: firmapost@hoh.no

BWT Vattenteknik AB
Box 9226
Kantyxegatan 25
SE-213 76 Malmö
Tel : +46 40 691 45 00
Fax: +46 40 21 20 55
E-Mail: info@vattenteknik.se

BWT Separtec OY
PL 19 Varppeenkatu 28
FIN-21201 Raisio
Tel : +358 2 4367 300
Fax: +358 2 4367 355
E-Mail: hoh@hoh.fi

BWT Austria GmbH
Walter-Simmer-Strabe 4
A-5310 Mondsee
Tel : +43 6232 5011 0
Fax: +43 6232 4058
E-Mail: office@bwt.at

BWT Wassertechnik GmbH
Industriestraße 7
D-69198 Schriesheim
Tel : +49 6203 73 0
Fax: +49 6203 73 102
E-Mail: bwt@bwt.de

Gillichemie Italiana SRL
Via Plinio 59
I-20129 Milano
Tel : +39 02 204 63 43
Fax: +39 02 201 058
E-Mail: info@cillichemie.com

BWT France SAS
103, Rue Charles Michels
F-93206 Saint Denis Cedex
Tel : +33 1 4922 45 00
Fax: +33 1 4922 45 45
E-Mail: bwt@bwt.fr

BWT Belgium NM.
Leuvensesteenweg 633
B-1930 Zaventem
Tel : +32 2 758 03 10
Fax: +32 2 758 03 33
E-Mail: bwt@bwt.be

BWE Česká Republika s.r.o.
Lipovo 196 -Cestlice
CZ-251 01 Říčany
Tel : +42 272 680 300
Fax: +42 272 680 299
E-Mail: info@bwt.cz

BWT Polska Sp. z o.o.
ul. Polczyhska 116
PL-01-304 Warszawa
Tel : +48 22 6652 609
Fax: +48 22 6649 612
E-Mail: bwt@bwt.pl

BWT Hungária Kft.
Keleti út. 7.
H-2040 Budaörs
Tel : +36 23 430 480
Fax: +36 23 430 482
E-Mail: bwt@bwt.hu

BWT UK Ltd.
Coronation Road, BWT House
High Wycombe
Buckinghamshire, HP12, 3SU
Tel : +44 1494 838 100
Fax: +44 1494 838 101
E-Mail: info@bwt-uk.co.uk

BWT Nederland B.V.
Centraal Magazijn
Energieweg 9
NL-2382 NA Zoeterwoude
Tel : +31 88 750 90 00
Fax: +31 88 750 90 90
E-Mail: sales@bwt nederland.nl

BWT AQUA AG
Hauptstraße 192
CH-4147 Aesch
Tel : +41 61 755 88 99
Fax: +41 61 755 88 90
E-Mail: info@bwt-agua.ch

OOO Russia BWT
Ul. Kasatkina 3A
RU-129301 Moscow
Tel : +7 495 686 6264
Fax: +7 495 686 7465
E-Mail: info@bwt.ru

Cillit S.A.
C/Silici, 71 -73
Poligono Industrial del Este
E-08940 Cornelia de Llobregat
Tel : +34 93 440 494
Fax: +34 93 4744 730
E-Mail: cillit@cillit.com