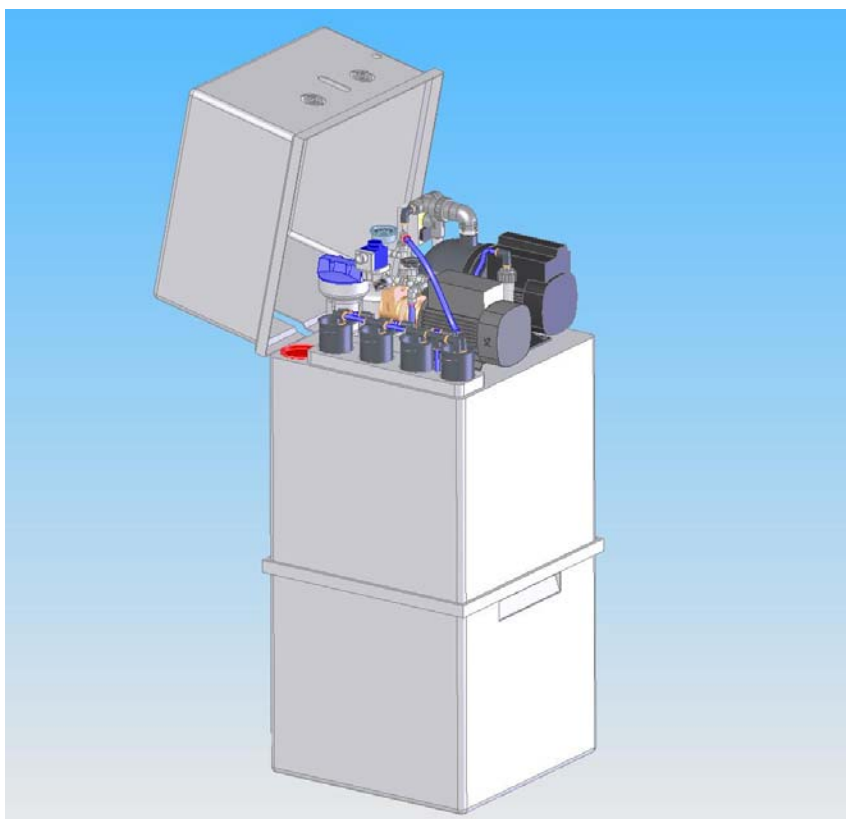


# **ASSEMBLY AND MAINTENANCE MANUAL FOR HOH RO 270-SERIES REVERSE OSMOSIS PLANT**



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## 1. IN GENERAL

This assembly and service manual applies to HOH RO 271-274 totalafsaltningsanlæg.

This assembly and service manual contains **important** information about the correct installation and operation of the RO plant which is why the following is very **important**.

1. **Enclosed "Start-up control" shall be completed during start-up and then be filed together with the operating journal.**
2. **Operating journal shall be updated as described under: Various enclosures.**
3. **There must be a floor drain in the immediate vicinity of the plant.**
4. **The RO plant removes 95-98 % of all salts, so you have to install a post-treatment unit, e.g. a mixed bed or similar, if a better water quality is requested.**
5. **Our warranty no longer applies if the plant is not started up by an authorised HOH service technician**

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

YOUR RO-270 is a compact design with reservoir tank and RO plant built together in order to take up a little space as possible. The RO-270 plant with its compact and finished design is easy to install, since all installations are pre-assembled and tested in our factory.

Your RO-270 plant is equipped with casters and constructed in a stainless steel frame. That means that the plant can be placed e.g.

underneath a table and then pulled out for a service check. Your RO-270 plant is equipped with a powerful reservoir pump which supplies water at a pressure flow as the normal water-works pressure/flow. Your RO-270 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 RO 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.

**Raw water:** Is the water which is led directly to the RO plant and which must be desalinated in the RO plant.

**TDS:** The amount of totally dissolved salts in measured in the unit mg/l.

**Conductivity:** Is the designation of salt concentration of the water and it is measured in the unit  $\mu\text{S}/\text{cm}$ . The lower the figure,

the better the water quality.

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

**RO:** The abbreviation for Reverse Osmosis.

**Reservoir-pump:** is the pump which transports the treated water from the plant reservoir to the consumer.

**Level sensor:** Is a sensor which gives a signal when the RO plant must either be started or stopped, and it stops the reservoir 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. PLACING OF PLANT

The plant must be placed in a non-freezing environment on a even foundation so that the water in the reservoir does not overflow when the tank is full. the foundation must be able to stand a load of approx. 330 kg which is the plant weight when full.

The plant is furnished with casters, so if you wish to be able to move the plant, you should keep the foundation even and solid.

The outside measures of the plant are (WxDxH): 570x570x1350 mm, but when placing the plant you should take into account that the cover shall

be demounted during maintenance work. Either you must calculate with an additional 370 mm in height to be able to lift the cover, or it should be possible to roll the plant out for servicing (e.g. place it under a table or equal).

You should also make room on the back of the plant for the water installation; especially you should take into account the outlet hose from the plant. **The hose may never be bent!**

Placing of the plant must be done in a way so that the air intake on the front never gets covered. There must also be room in front of the plant, so that it is possible to freely read the flow, and the suction of the high-pressure pump can take place without obstruction. Also it should be possible to pull out the plant in connection with maintenance. In case of a stoppage, the reservoir may overflow. Therefore there should always be a drain in the immediate vicinity of the plant so that the overflowing water does not cause damage.

**If there is no floor drain near the plant, installing the plant is at your own risk.**

#### 4. WATER QUALITY

The raw water, which is to be treated in the RO 51 unit, must be softened drinking water quality with maximum 500 mg/l TDS. The raw water may maximum contain:

- \* Fe: 0.05 mg/l
- \* Mg: 0.02 mg/l
- \* Free chlorine: 0.1 mg/l
- \* Turbidity, maximum: 1.0 NTU
- \* Silt index: 3.0
- \* KMnO<sub>4</sub> max: 10 mg/l

Max. temperature: 25 °C. The plant is adjusted at 10 °C in our factory. If there are doubts about the raw water composition, a water analysis must be made. The plant must be connected to a

raw-water pressure of minimum 2 bar and maximum 7 bar. The quality of the treated water will be less than 20 µS/cm at 10 °C.

#### 5. WATER CONNECTIONS

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

##### 5.1 Connection of raw water/inlet water:

On the inlet side you must fit a ball valve so that the water may be cut off during maintenance of the plant.

Install a ½" flexible pressure hose on the pre-filter of the plant (A-figure 2). The opposite end shall be connected to the raw-water supply.

The best operating result is obtained by connecting to minimum ¾" raw-water pipe. That reduces the drop in pressure to the plant. With a too small raw-water connection, there will be a risk of outage on the plant due to lacking water pressure, e.g. when rinsing out the membranes at start-up of the plant.

##### 5.2 Connection of outlet water (treated water)

Fit the supplied ¾" flexible pressure hose to the reservoir pump (B-figure 2). The opposite end shall be connected to the consumer of the treated water or pipe connection which is led to ½ consumer of the treated water.

**Note!** Totally desalinated water may speed up corrosion. Therefore, always use corrosion-proof piping for the treated water, e.g. stainless steel or PVC.

##### 5.3 Connection of outlet hose

Start by dismounting the "bent" blue hose which is fitted on the outlet valve (B-figure 3). Install the supplied 10 mm plastic hose to outlet valve (B-figure 3). It is **important** that the hose is pressed all the way down. The

opposite end shall be connected to outlet. The hose may not be led down into the outlet water, though, since the water may risk getting sucked back into the plant during standstill. **Note!** The outlet hose may never be bent or in any other way obstructed, as this would damage the plant membrane(s).

##### 5.4 Connection of overflow hose

On the back of the plant, on the overflow nozzle (C-figure 2), you shall connect a ½" plastic hose to the floor drain or another subja-cent drain. This overflow is a safety overflow in case an error occurs on the level sensor of the plant and the reservoir tank as a consequence gets filled to overflowing.

#### 6. ELECTRICAL CONNECTIONS

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

The electrical connection to the RO 100 unit must be as follows:

- \* Voltage: 230 Volt-50 Hz
- \* Fuse: 10 Amp
- \* Max. power consumption: 1.5 kW
- \* The plant must be connected to phase + 0 + E.

All internal connections in the plant like e.g. pump control and level control are pre-assembled in our factory. This means that only the supplied wire which is connected to the control box (C-figure 3) must be connected to a power switch/circuit breaker.

##### Colour code of power cable:

- Blue wire: 0
- Brown wire: Phase
- Yellow/green wire: Earth

If for some reason you need to change the factory-mounted

power cable, please cf. paragraph: Various enclosures “electric diagrams”

## 7. START-UP OF PLANT

Check prior to start-up that all water and electrical connections are made as described in previous paragraphs and in compliance with local regulations. Open the raw-water supply. Check that all water connections are tight.

Pull the permeate hose (A-figure 3) out of the reservoir tank and lead it away from the tank to a drain.

Open the outlet valve (B-figure 3) Now switch on the 230 Volt 50 Hz power supply. Also switch on the main switch located on the control box (C-figure 3).

The plant is now operating. Now the plant shall operate and flush to outlet for 20-30 minutes before adjusting the outlet valve once more.

When the flushing is finished, adjust the outlet valve (B-figure 3) again. Read below paragraph carefully before starting up the plant.

### 7.1 Adjustment of outlet amount

*Important! Read the entire paragraph 7.1 and 7.2 before adjustment is commenced.*

Outlet amount must be adjusted, and the suitable outlet amount on your plant depends on the raw-water quality. A too high water recovery will damage the plant membranes. On condition that the raw water complies with the quality requirements, the plant can operate with a recovery rate of 40 %. With softened feed water, you may obtain a recovery of 70-80 % dependent on the amount of organic material in the water.

Finally, the plant recovery affects the conductivity of the permeate. That means that if a retention greater than 98 % is requested,

the plant recovery can be adjusted at a lower level. Please note that the plant retention rate of 98 % applies by 75 % recovery. Contact HOH Water Technology A/S the supplier of your plant to decide which outlet amount is suitable for your water.

Plant type	Permeate capacity l/h	Outlet amount l/h (Recovery)			
		Ground water	Surface water	Soft water	2nd pass
		40 %	50 %	75 %	85 %
271	110	165	110	37	19
272	220	330	220	73	39
273	310	465	310	103	55
274	400	600	400	133	71

An easy way of checking the outlet amount of the plant is:

$$\text{outletamount (l/h)} = \frac{100 \times \text{permeatecapacity (l/h)}}{\text{recovery (\%)}} - \text{permeatecapacity (l/h)}$$

Ex.: RO 273 with 40 % recovery

$$\text{Outletamount l/h} = \frac{100 \times 310}{40} - 310 = 465 \text{ l/h}$$

When the requested amount of outlet water has been obtained, tighten the lock nuts on the outlet valve (B-figure 3) so that it is locked. It is important to check the outlet amount after the lock nuts have been tightened to make sure that the valve has not moved. Both lock nuts must be tightened.

**Important!** The outlet valve must be locked on the prescribed outlet amounts. If the needle valve is closed so that the outlet amount is reduced, then the plant membranes will become damaged.

### 7.2 Adjustment of recirculation amount

Then the recirculation amount (D-figure 3) must be adjusted by loosening lock nut on the recirculation valve. Adjust the permeate amount at maximum 110-400 l/h for RO-271-274 respectively, at a temp. of 10-25 °C.

If the temp. is below 10 °C, the capacity will be 3 % below normal capacity for every degree under 10 °C.

If e.g. the raw-water temp. is 8 °C, for an RO-274 it means that the permeate capacity is 6 % below the normal 400 l/h, i.e. 376 l/h. At the same time make sure that the pressure on the manometer (E-figure 3) does not exceed 12 bar + inlet pressure from the water supply, however maximum 16.5 bar.

The normal pressure indicated on the manometer in order to obtain normal permeate capacity will be approx. 12-15.5 bar.

When the requested pressure and permeate capacities have been obtained, check again if the outlet amount has been adjusted correctly.

(We recommend that you loosen both lock nuts while the valves are fine-adjusted).

When both valves have been adjusted, they shall be locked with the lock nuts. Please take care not to move the valve when you tighten the lock nut

**NB!** When the valves have been locked, the plant shall be started and stopped 4-5 times, and then the flow shall be checked again; the valves are re-adjusted if necessary.

Now check that the quality of the treated water on the permeate hose (A-figure 3); the conductivity shall be below 20 µS/cm (conductivity meter is available as accessory). If the water quality is below 20µS/cm it is OK and the hose can be led back to the hole in the reservoir tank.

The 270 litre reservoir tank now will be filled up with treated water <20 µS/cm.

Write the operating data in the enclosed operating journal (see paragraph – Operating journal).

### 7.3 Deaeration of reservoir pump

The reservoir pump (G-figure 3) shall now be deaerated.

This is done by filling in treated water in the filling hole (N-figure 3) located at the top of the pump head.

Dismount the filling cap and fill in the treated water until it flows over (approx. 3-4 litres), and then refit the filling cap.

The pump has now been deaerated. The pump pressure switch and hydrophore are preset from our factory and shall not be adjusted.

**Note!** The reservoir pump (G-figure 3) will not start until the reservoir tank has been completely full. Check that the on/off switch of the reservoir pump is in position ON! (not all pump motors have this on/off switch).

**Check that the motor is running in the right direction.**

Wait for the reservoir tank to fill up complete (approx. 20 min). Check that the level sensor (H-figure 3) automatically interrupts 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 reservoir pump (G-figure 3) automatic starter.

Let the pump operate a while with a very large flow in order to get possible air out the pump housing.

Check if the pump supplies water and pressure. If the pump does not supply water and pressure, then try deaerating the pump once more as described earlier.

When the reservoir pump is working, shut off the consumption of treated water.

Wait for the reservoir pump to stop automatically.

**Note! (on HOH reservoir plants):**

The reservoir pump stops 10-15 seconds after the consumption has stopped due to the built-in time delay in the control box.

Re-create a consumption of treated water and this time let the reservoir pump (G-figure 3) empty out approx. 100 litres of the reservoir tank content.

Check that the plant automatically starts up and produces treated water.

This can be read on the plant flow meter (F-figure 3).

The plant has now been started and is ready for use.

## 8. AUTOMATIC FUNCTION

The RO-270 plant is equipped with a control box with following functions integrated:

Level control in reservoir tank.

Stop and start of high-pressure pump.

Opening and closing of solenoid valve.

Safety stop of reservoir pump in case of dry-running of the tank.

Pressure switch control of raw-water pressure.

Pressure switch interrupts the plant by too low raw-water pressure < 0.5 bar delayed for 15 seconds. Red LED in control panel indicates outage of plant.

Pressure-switch control of reservoir pump.

Stop and start of reservoir pump – stop at 4.2 bar – start at 3.7 bar.

Stop of pump is delayed by 20/30 seconds.

## 9. MAINTENANCE AND TROUBLE-SHOOTING

### 9.1 Maintenance

The RO plant is produced and designed for a minimum of ser-

ving and maintenance. However, there are some functions which should be checked regularly. (The interval is described in paragraph: Service Intervals).

**Following must be checked regularly:**

The capacity of the treated water can be checked on flow meter (F-figure 3).

If the capacity has dropped by more than 10 % of the capacity on the day of start-up, see paragraph: Trouble-shooting.

The quality of the treated water shall be checked with a conductivity meter on the permeate hose (A-figure 3) while the plant is operating.

If the quality of the treated water is  $\geq 20 \mu\text{S/cm}$ , see paragraph: Trouble-shooting.

Check that the pressure on manometer (E-figure 3) is 12-16.5 bar when the plant is in operation. If the pressure is lower than 12 bar, see paragraph: Trouble-shooting.

### 9.2 Trouble-shooting

*this paragraph deals with the problems that may occur on the plant.*

#### 9.2.1 Plant capacity has dropped

*This capacity can be read on the flow meter (F-figure 3) while the RO plant is operating.*

**Check:**

The operating pressure which must be 12-16.5 bar while the plant is operating; it can be checked on the manometer (E-figure 3). If the operating pressure is below 12 bar, replace pre-filter (M figure 3) with new 5"-5 µ micron filter cartridge. The Micron filter shall also be replaced if it is very dirty. Check also if the raw-water pressure is the same as by start-up. If it is below 2 bar, look for the error in the water supply.

### Check:

The raw-water temperature; if the raw-water temperature has dropped compared to the day of start-up (winter/summer), the capacity will also drop, and it will increase at a higher temperature. For every °C± the plant capacity will either drop or rise by approx. 3%

That means if the temp. has dropped by 4 °C compared to start-up time, the capacity can drop by approx. 12 %. This is quite normal and does not require a service check.

Rinse the membranes for 20 min with the recirculation valve (D-figure 3) completely closed and outlet valve (B-figure 3) completely open. After rinsing, adjust these valves again as described in paragraph: Start-up of Plant.

### Check if:

there is a bend on the outlet hose (C-figure 2). If the plant capacity cannot be improved by these solutions, the membranes are clogged and must be cleaned; See paragraph: Cleaning – Replacement of membranes.

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

#### Check if:

there is a bend on the outlet hose (C-figure 2).

Correct the error by replacing the hose.

#### Check if:

the plant has been out of operation for long, i.e. 1 week or longer.

Correct the error by letting the plant operate for 1-2 hours and then keep it operating minimum every 3<sup>rd</sup> day. Remember to adjust outlet/re-circulation valve after finished flush; See paragraph: Start-up of Plant.

#### Check if:

there are leaks on the raw-water side. If so, raw-water comes in

connection with the treated water in the reservoir tank. Repair this fault by sealing possible leaks, empty the reservoir tank of water and let the plant fill in new, clean and treated water <20 µS/cm.

If none of these errors are present, the plant membrane is defective and must be cleaned/replaced, see paragraph: Cleaning/Replacement of Membrane.

### 9.2.3 Alarm low Inlet Pressure

*This can be checked on the control box (E-figure 1)-(C-figure 3).*

- Power: fixed light
- Alarm: fixed light
- Inlet: flashes slowly

The plant will restart automatically 3 times and then generate a permanent alarm.

- Power: fixed light
- Inlet: flashes slowly
- Alarm: fixed light

#### Check if:

the pre-filter (M-figure 3) is choked.

Correct the error by shutting off the raw water and release the pressure on the pre-filter. Then replace the pre-filter by a new 5"-5 µ micron filter. Cut off the power supply of the plant for 20 seconds. Reconnect power.

#### Check if:

the raw-water pressure is present.

Correct the error in the raw-water supply. When the raw-water pressure has been re-established, cut off the power supply for 20 seconds. Reconnect the power.

If none of above-mentioned errors are found, it may be the pressure switch located on the pre-filter (M-figure 3) that is defective, or the PCB in the control box is defective.

### 9.2.4 Alarm Transport Pump

- Power: Fixed light
- Alarm: Fixed light
- Transport pump: flashes slowly

#### Check if:

the transport pump is requesting water.

Create a water consumption on the outlet of the transport pump – if the pump is running, find the error elsewhere; plant and pump control are in order.

### 9.2.5 Level Low

- Power: fixed light
- Level: flashes slowly.

The reservoir tank has run dry.

Let the tank fill up completely, then the transport pump starts up again automatically.

**Note!** If the reservoir tank has been totally drained, the transport pump will only re-start when the reservoir tank is completely full. This is controlled by the level sensor (H-figure 3).

#### Check if:

the pressure switch on the transport pump is defective.

Short the pressure switch by making a bridge between the two plugs. If the pump is only running when this bridge is connected and there is a "call" for water, then the pressure switch is defective and must be replaced.

#### Check if:

the on/off switch of the reservoir pump is set at OFF. If none of these errors are found, the PCB or the reservoir pump is defective and must be replaced. If this does not help, the capacity may be too small.

### 9.2.6 Level High

- Power: fixed light
- Level: flashes slowly
- Alarm: fixed light

#### Check if:

the inlet solenoid valve is closed and tight. If the permeate hose (A-figure 3) drips constantly

when the plant is not operating, the solenoid valve is defective and must be replaced.

**Check if:**

the level sensor (H-figure 3) is prevented from interrupting the plant (stuck).

Remove possible blockage from the level sensor.

### 9.2.7 The plant is not running

**Check if:**

The main power is connected.

**Check if:**

The main switch on the control box is connected – I.

**Check if:**

The plant needs to operate? –

Full reservoir tank or no “call” for water!

If none of above-mentioned

errors are found, the high-

pressure pump or the control

PCB may be defective; Check

these.

### 9.2.8 Reservoir pump stops and starts

The reservoir pump stops and starts at 10-15-second intervals without consumption of treated water.

**Check if:**

there is a leak on the piping from plant outlet to consumption of treated water, or a defect at consumer, e.g. would a defective/leaky valve create a small water consumption which makes the reservoir pump start and stop constantly.

**Check if:**

the non-return valve in the suction sensor of the reservoir pump, located at the bottom of the reservoir tank, maybe is leaky/defective. If so, it must be replaced.

**Check if:**

The reservoir pump hydrophore lacks air. The hydrophore must always be pre-pressurized at 2.9 bar.

### 9.2.9 Hard water is measured at the soft-water tap

**Check if:**

there is salt in the softening plant salt tank.

Fill in salt tablets and start regeneration.

**Check if:**

The softening plant is adjusted at the current hardness of the raw water (see paragraph: Start-up of Plant).

If none of above-mentioned errors are found, the softening plant must be service-checked.

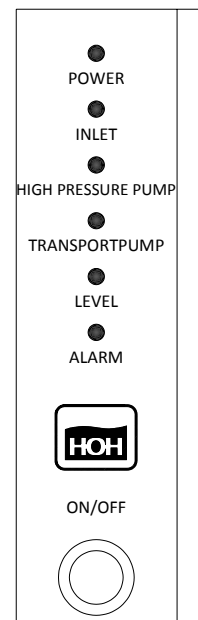
### 9.2.10 Survey of Alarm Conditions

LED functions:

During normal operation the LED shines in correspondence with the components it represents.

#### Error conditions:

External stop high-pressure pump: (Transport pump is working)	(1) shines + (3) flashes slowly (½ Hz) (Power) (High-pressure pump)
External stop transport pump: (High-pressure pump does not work) can be jumped by start-up	(1) shines + (4) flashes slowly (Power) (Transport pump)
On-time alarm on transport pump: (Nothings's working - permanent condition)	(1) shines + (6) shines + (4) flashes slowly (Power) (Alarm) (Transport pump)
Re-start alarm on transport pump: (nothing is working – permanent condition)	(1) shines + (6) shines + (4) flashes quickly (5 Hz) (Power) (Alarm) (Transport pump)
Too low inlet pressure (re-start): (HP pump stopped – TP pump is working)	(1) shines + (2) flashes slowly (Power) (inlet)
Too low inlet pressure (alarm): (Nothings is working – permanent condition)	(1) shines + (6) shines + (2) flashes slowly (Power) (Alarm) (Inlet)
Too low water level (no alarm): (TP pump stopped – HP pump is working)	(1) shines + (5) flashes slowly (Power) (water level)
Too high water level (alarm): (nothing is working – permanent condition)	(1) shines + (6) shines + (5) flashes quickly (Power) (Alarm) (water level)
<b>Times:</b>	
Delay on start high-pressure pump: DEL: Short duration/long duration	5/15 seconds
Operating time on transport pump: Max. consecutive time.	20 minutes
Start/stop of transport pump: Max. number per hour:	60











### 9.2.11 Times

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 jumpers/switches:

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

#### FACTORY SETTINGS

DEL / OFF 5 SEK.		DEL / ON 15 SEK.
ALARM / OFF INGEN ALARM		ALARM / ON STOP EFTER 20 MIN.
MODEL / OFF RO-41		MODEL / ON RO-270
		2 / ON 20 SEK. START MAX. 60 PR. TIME
		4 / ON 20 SEK. START MAX. 90 PR. TIME
		6 / ON 30 SEK. START MAX. 109 PR. TIME
		16
		32

## 10. TECHNICAL SPECIFICATION

### 10.1 Technical Specifications

Signature	Designation	Type/data
P1	High-pressure pump	Procon: 2539/Grundfos MG80B, 12-16.5 bar, 1x230V, 0.55kW
P2	Reservoir pump	CHI2-50, 1x230V, 0.80 kW
FI 1	Flow meter	Ø32 PVC
PI 1	Manometer	0-40 bar, ¼"
V1	Needle valve	¼" brass
V2	Needle valve	¼" brass
Y1	Solenoid valve NC	½" brass
PS 1	Pressure switch NO	¼" 0.5 bar
PS 2	Pressure switch NC	½" 2-6 bar
QIS 1 (Option)	Conductivity meter	½" connection for sensor

### 10.2 Technical data:

RO 270 SERIES	RO 271	RO 272	RO 273	RO 274
Capacity l/h*	110	220	310	430
Maximum water recovery, %**	40-80	40-80	40-80	40-80
Salt retention, %	95-98	95-98	95-98	95-98
Conductivity, µS/cm	<20	<20	<20	<20
Reservoir l	270	270	270	270
Power connection, V	230	230	230	230
Power consumption, kW	1.3	1.3	1.3	1.3
Electrical frequency, Hz	50	50	50	50
Pipe inlet, Diameter, "	½"	½"	½"	½"
Concentrate outlet, Diameter, "	10mm Hose	10mm hose	10mm hose	10mm hose
Permeate outlet, Diameter, "	¾"	¾"	¾"	¾"
Height, mm	1360	1360	1360	1360
Length, mm	580	580	580	580
Depth, mm	580	580	580	580
Maximum water temp.	25°C	25°C	25°C	25°C
Maximum water pressure	7 bar	7 bar	7 bar	7 bar
Minimum water pressure	2 bar	2 bar	2 bar	2 bar
Weight (full)	330 kg	332 kg	334 kg	336 kg
Number of membranes	1	2	3	4

\* At drinking water quality 10°C, 3 bar, max. 500 mg/l total salt content ± 15 % capacity

\*\* Calculated at a drinking water quality of 500 µS/cm

## 11. FUNCTIONAL DESCRIPTION

Raw water must be drinking water quality with residual chlorine. If there is free chlorine in the raw water >0.1 mg/l, a carbon filter must be installed ahead of the plant.

The stated capacities and qualities are based on a salt content in the raw water of maximum 500 mg/l TDS and 10 °C. In case of a different raw-water quality, the supplier must be contacted. (See the paragraph: Water Quality). The raw water is pressed through the RO module (modules) by means of a high-pressure pump. The desalinated water penetrates the RO membrane and is collected in the reservoir. The water containing the concentrated salts (the concentrate) is led through the RO module/s and on to drain. The ratio permeate/drain has been pre-adjusted manually by means of a needle valve.

The raw water passes a pre-filter with a 5-micron cartridge. If necessary, a dechlorination filter with active carbon cartridge (aux. equipment) can be installed by a chlorine content of >0.1 mg/l. A pressure switch on the raw-water inlet stops the raw-water pump in case of too low pressure (<0.5 bar). To get the plant started again, you have to switch off the power and then reconnect again (interrupt for 20 sec.). The permeate hose is equipped with level switch controlling the raw-water intake and the high-pressure pump stop and start. Likewise the reservoir pump is stopped prior to possible dry-running of the tank.

Desalinated water is automatically led to consumption by means of the reservoir pump. Consumption, however, is limited by the plant permeate capacity and by the storage size 100 l. If necessary it is possible to install an ion exchange unit (mixed-

bed) in order to improve the water quality, and/or a UV-lamp for sterilization (aux. equipment). The plant is fitted on casters and should be assembled with flexible connections. Place the plant so that it can be pulled out for service check-ups.

Under normal operating conditions the RO-membranes have a long life. But even with a good raw-water quality there will be a coating of impurities and thus a slow reduction of the permeate capacity. When the capacity has been reduced by 10 %, the membranes must be cleaned. If regular cleaning is done at correct intervals, the original capacity can easily be restored.

**NB! The permeate capacity is also directly dependent on the raw-water pressure and the water temperature. the capacity will deteriorate by poor pressure and temperature, and it will increase by rising temperatures. In case of reduced capacity, the raw-water pressure and temperature shall be checked before proceeding to the cleaning procedure.**

## 12. CLEANING/- REPLACEMENT OF MEMBRANES

*Read paragraph 12 carefully before cleaning/replacing the membranes.*

### 12.1 Cleaning procedure:

Following shall be done prior to cleaning:

Empty out approx. 100 litres of treated water from the reservoir tank.

Switch off the power supply.

Shut off the raw-water supply.

Dismount the raw-water inlet hose at the opposite end of the pre-filter (M-figure 3).

Take out the micron filter located in the pre-filter housing (M-figure 3). Fill the filter housing with raw water before re-mounting it.

Open the outlet valve (B-figure 3) completely and close the recirculation valve (D-figure 3).

Lead the permeate hose (A-figure 3) away from the reservoir tank and lead the hose up into the bucket containing cleaning agent. Take a plastic bucket, , minimum 25 litres, or order special CIP tank for RO271-274 from HOH Water Technology A/S and fill in 25 litres of warm raw water 40°C. Place the bucket on a somewhat higher level than the pre-filter (M-figure 3)

Lead the raw-water connection all the way into the bucket.

Short the wires on the safety pressure switch fitted on the filter housing (M-figure 3) by connecting the 2 wires or jump the terminals 1 and 4.

Lead the outlet hose (C-figure 2) into the bucket with the heated water.

Start the plant by re-connecting power to the plant.

When it starts up, the plant will make some "noise" until the warm water has entered the plant.

Operate the plant in this way for 20-30 minutes, until the plant components (membranes/-pump) are heated up to approx.. 40°C. Replace the water in the bucket continuously in order to keep the water at 40°C during the heating period.

When the plant components are heated up at 40 °C, you must stop the plant by switching off the power.

Re-fill water into the bucket, 40°C. We recommend using treated water for this purpose.

Mix in citric acid in the ratio 2% in 25 litres of water. I.e. ½ kg citric acid for 25 litres of water.

Re-start the plant by switching on the power.

Operate the plant for 5 min. with this solution of citric acid.

Then stop the plant for 5 min. operate the plant again for 5 min. This procedure must be

carried out 3 times, i.e. 3 times 5 minutes in operation and 3 times 5 minutes' break between each operating period.

If the membranes are much clogged due to belated cleaning, it is recommended to perform the cleaning procedure from the start once more with a new solution of citric acid. This extra cleaning should not be necessary if the capacity has only dropped by 10 %.

When the cleaning procedure is finished, the cleaning agent shall be disposed of in a sensible way, and the raw-water hose (A-figure 2) shall be reconnected to the raw water.

The outlet hose (C-figure 2) shall be led back into the drain.

Refit (possibly a new) 5"-5µ pre-filter in the pre-filter housing (M-figure 3) and reconnect the wire to the pressure switch on the pre-filter.

Restart the plant and flush the plant for 20-30 minutes.

When the plant has been flushed, adjust the outlet/recirculation valve (B-figure 3) again. (see paragraph: Start-up of Plant).

When the plant operating pressure, which can be read on the manometer (E-figure 3) has reached 12-16.5 bar, check the permeate hose (A-figure 3) to make sure the water quality is <20 µS/cm (conductivity meter can be supplied as aux. equipment). If the water quality is >20 µS/cm, then the plant must operate for 10-20 min. before making a new check-up.

Check if the plant capacity, read on the flow meter (F-figure 3), is satisfactory.

When capacity and water quality are alright, lead the permeate hose (A-figure 3) back into the reservoir tank.

Now the plant is ready for normal operation.

If the plant does not reach full capacity after cleaning, you must perform a new cleaning.

If, after this cleaning, the capacity of the membranes is still not satisfactory, the membranes must be discarded and new ones must be installed.

## 12.2 Replacement of Plant Membranes

Before carrying out a cleaning, the following must be done:  
Empty out approx. 100 litres of the reservoir tank.

Switch off the power.

Disassemble the plastic hoses located on the top of the membrane (J-figure 3).

**Note:** how the hose is connected, since it is important that the hose be refitted in the same way!

The hoses can be pulled out by pushing the ring placed on the stainless fitting; if pushed all the way down, the hose can be pulled out.

Dismount the U-lock located at the end of the membrane pipe. (The U-lock holds the membrane endplate in place). Remove the split pin from the U-lock and pull the lock out of the pipe.

The end plate can now be pulled out of the membrane pipe by wriggling the end plate from side to side and simultaneously pulling upwards.

Now pull the membrane out of the membrane pipe. Note! at which end the large black O-ring is situated on the outside of the membrane. When the new membrane is fitted, this O-ring must be fitted at the same end of the membrane as the old one, i.e. if the O-ring sits at the top of the membrane pipe, the O-ring of the new membrane must also be installed so that the O-ring gets to be placed at the top when the membrane is fitted inside the membrane pipe.

When the membrane has been replaced and the end plate has

been refitted with the U-lock inserted, remount all hoses.

Note! When the hose connection is pushed into the stainless fitting, the "ring" must again be pressed all the way down and the same applies to the hose.

When all connections have been refitted and end plates are securely locked with the U-lock, the plant must be restarted.

You may replace pre-filter (M-figure 3) by new 5"-5µ membrane filter cartridge.

Reconnect the raw water.

Open the outlet valve (B-figure 3) completely.

Close the recirculation valve (D-figure 3) completely.

Dismount the permeate hose (A-figure 3) and lead it to drain.

Reconnect the power to the plant.

The plant will now be operating. Let it flush this way for 20-30 minutes.

Then adjust the outlet valve (B-figure 3) and the recirculation valve (D-figure 3), see paragraph: Start-up of plant.

Check the plant operating pressure on manometer (E-figure 3); it should be 12-16.5 bar which is normal operating pressure.

Check that the water quality is <20 µS/cm. This is checked on the permeate hose (A-figure 3) (Conductivity meter is available as aux. equipment). Lead the hose back when the quality is satisfactory.

Check on flow meter (F-figure 3) if the plant capacity is satisfactory. The plant is now in normal operation and ready for use.

### Write in the operating journal:

1. Date of replacement of membranes
2. New capacity of plant (F-figure 3)
3. Water quality (µS/cm)
4. Plant operating pressure (E-figure 3)
5. Raw water temperature
6. Raw-water pressure.

### **13. VARIOUS ENCLOSURES**

13.1 Flowsheet

13.2 Layout drawings

13.3 Wiring diagram

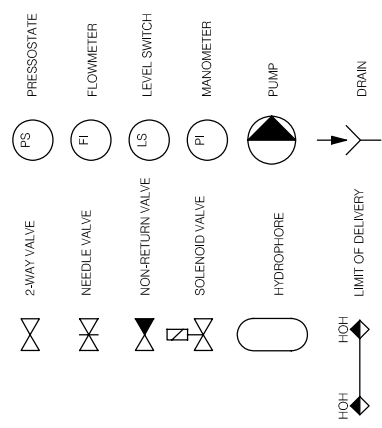
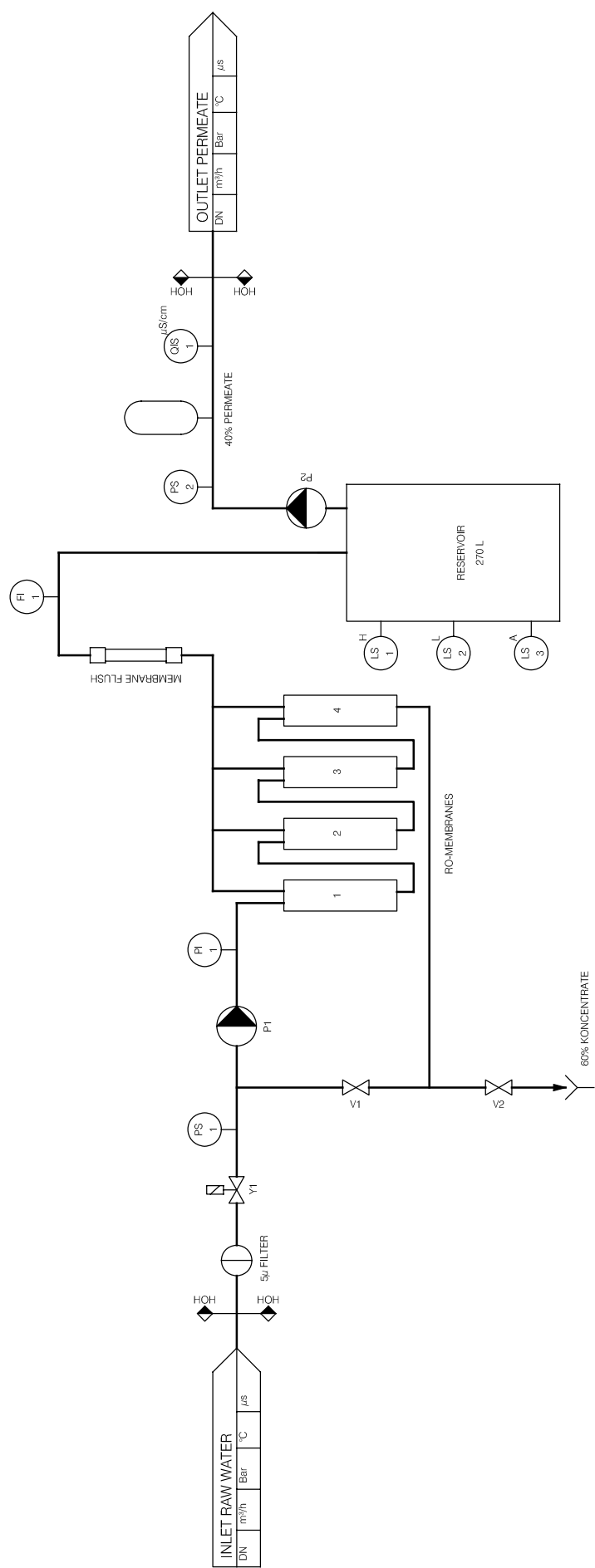
13.4 Servicing and maintenance  
table

13.5 Operating journal

13.6 Spare-parts list RO-100

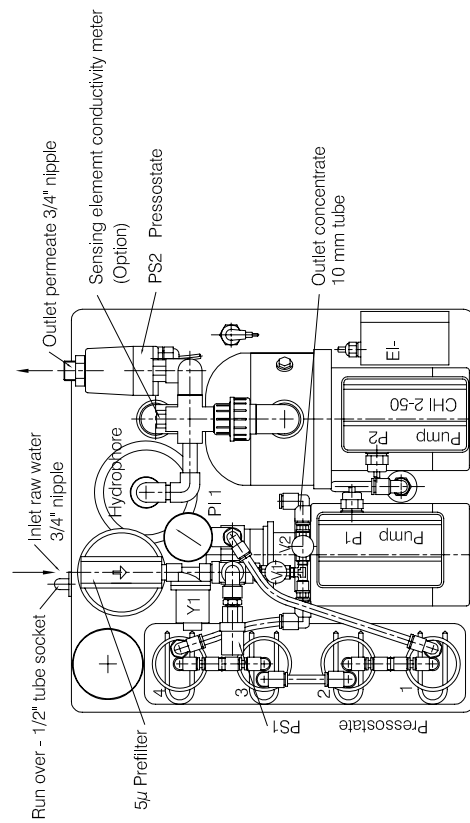
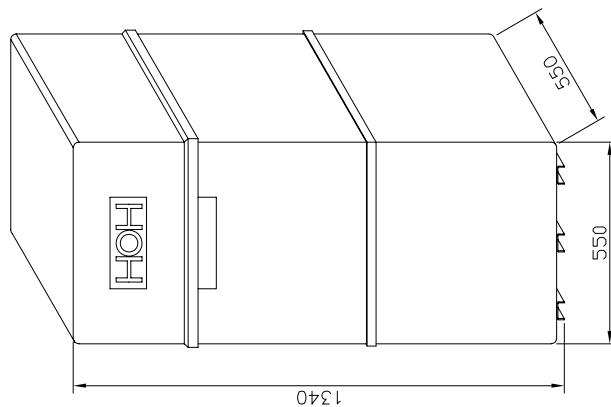
13.7 Spare-parts drawing

13.8 Declaration of conformity




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Scale	Designed by	Date	Quot. no.	Order no.
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			Drawing size	Material
			A2	
Weight [kg]				
Revision				
Page				
Drawing no.				
S376P01				
Revision				
A				
CAD file: S376P01A				
Hoh Water Technology A/S Hohvej 14, 1100 Copenhagen Ø Tel: +45 43 600 500 Fax: +45 43 600 500 E-mail: hoh@hoh.com				

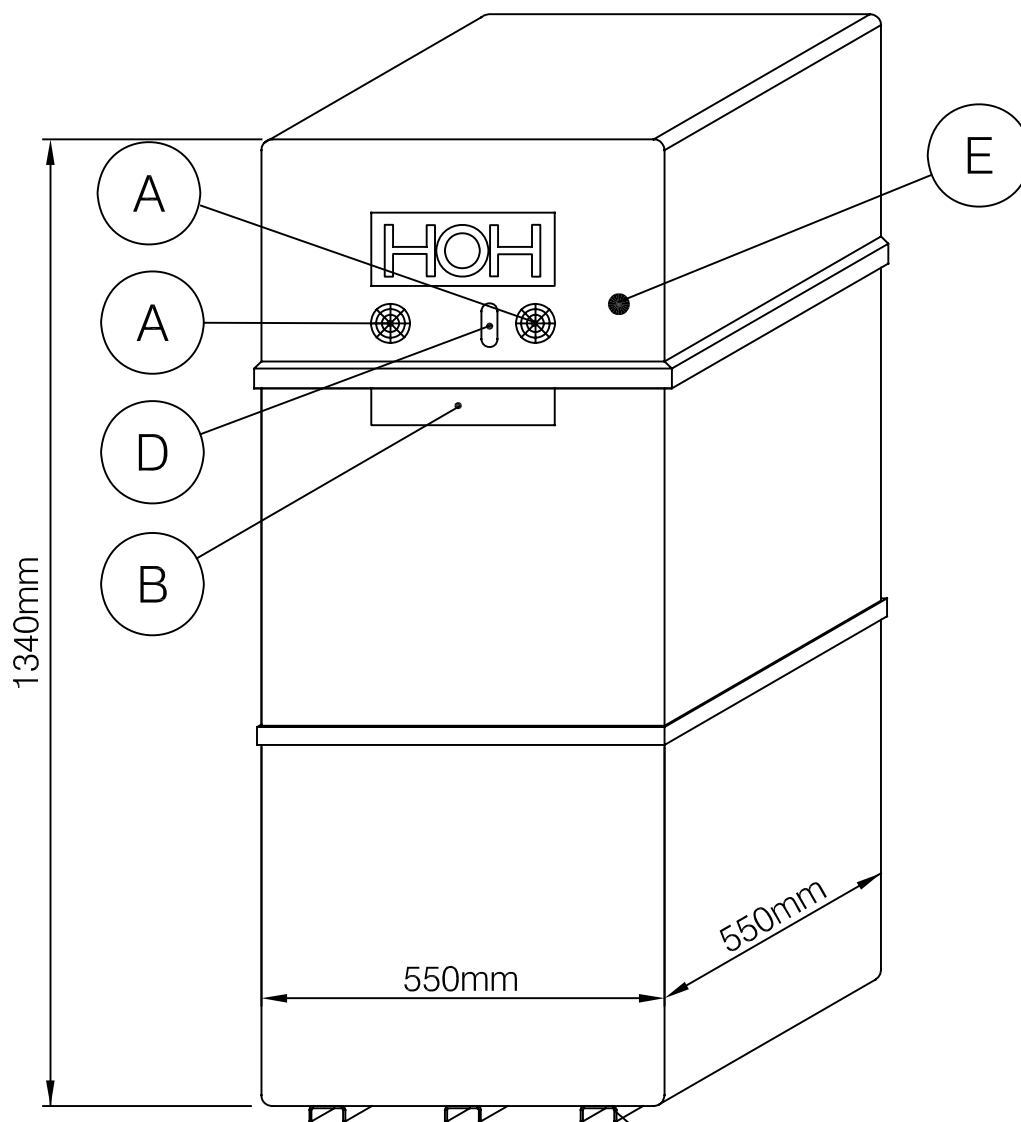
Reverse Osmosis Plant RO 270  
P & I Diagram



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# Reverse osmosis RO 270 series Arrangement drawing

Last Revision	Date	Drawn	Text
			 <p>HOH Water Technology A/S Gimlevej 24, DK-2670 Greve Tlf. +45 43 600 500 Fax. +45 43 600 900 E-mail: hoh@hoh.com</p>
		Drawing no.	S376M10
		Page	CAD file: S376M10
		Revision	



- A: Airintake for electric motors  
 B: Handle for moving of the plant  
 C: Wheels  
 D: Flowmeter for reading of permeate  
 E: Diode-alarm (lacking water pressure)

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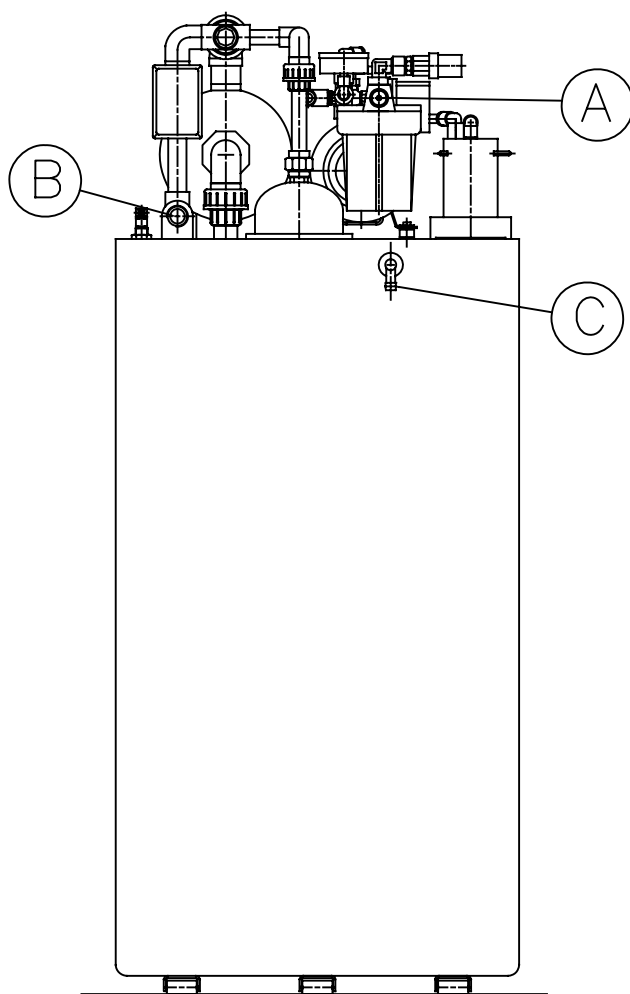
# RO SERIE 270 FIGURE 1 FRONT OF THE PLANT

Last Revision Date	Drawn	Text



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Drawing no.	Page	Revision
S376M05		
CAD file: S376M05		



- A: Raw water inlet (1/2" pressure hose)  
 B: Outlet treated water (3/4" pressure hose)  
 D: Overflow brach (should be led to floor outlet)

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1:10	TC	99.12.20			A4		

## RO SERIE 270

### FIGURE 2

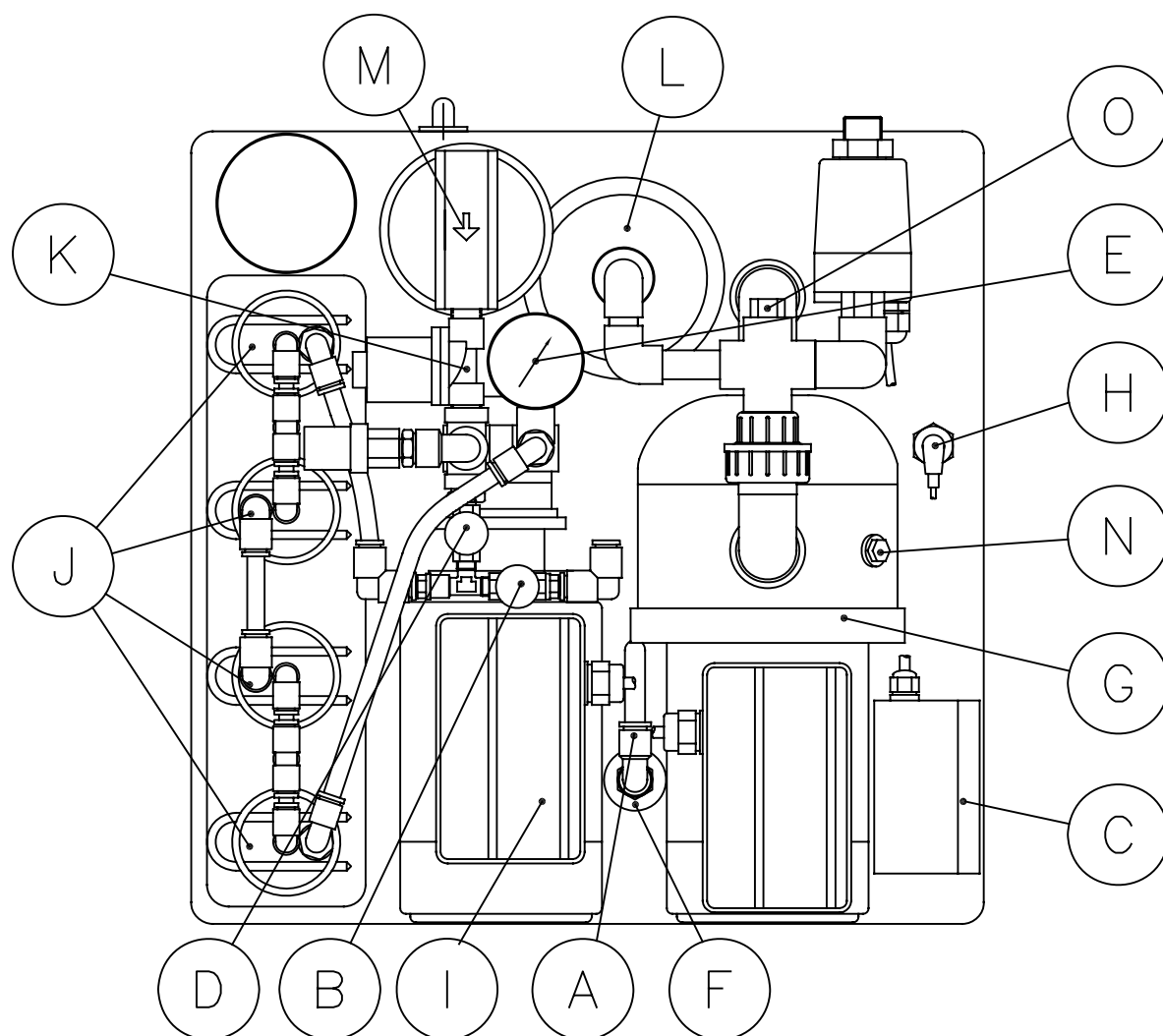
### BACKSIDE OF THE PLANT

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Drawing no.	Page	Revision
S376M06		A
CAD file: S376M06A		



- |                        |   |
|------------------------|---|
| A: Permeate hose       | I: High pressure pump                         |
| B: Outlet valve        | J: Membranes                                  |
| C: Control box         | K: Solenoid valve                             |
| D: Recirculation valve | L: Hydrophore                                 |
| E: Manometer           | M: Prefilter 5" - 5 $\mu$                     |
| F: Flowmeter           | N: Filler hole                                |
| G: Reservoir pompe     | O: (Option) Sensor for the conductivity meter |
| H: Level stick         |   |

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	TC	95.11.10			A4		

## RO SERIE 270

### FIGURE 3

### PLANT SEEN FROM ABOVE

Last Revision Date	Drawn	Text




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Drawing no.	Page	Revision
S376M07		A
CAD file: S376M07A		

1	Electrical connections.....	24-09-2008 09:30
2	Circuit board.....	24-09-2008 08:57

R051, 100, 270

Appr	24-09-2008		
Rev		HO	
Drw	11-06-2007	HO	
	Date	Ass	Appr

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S347

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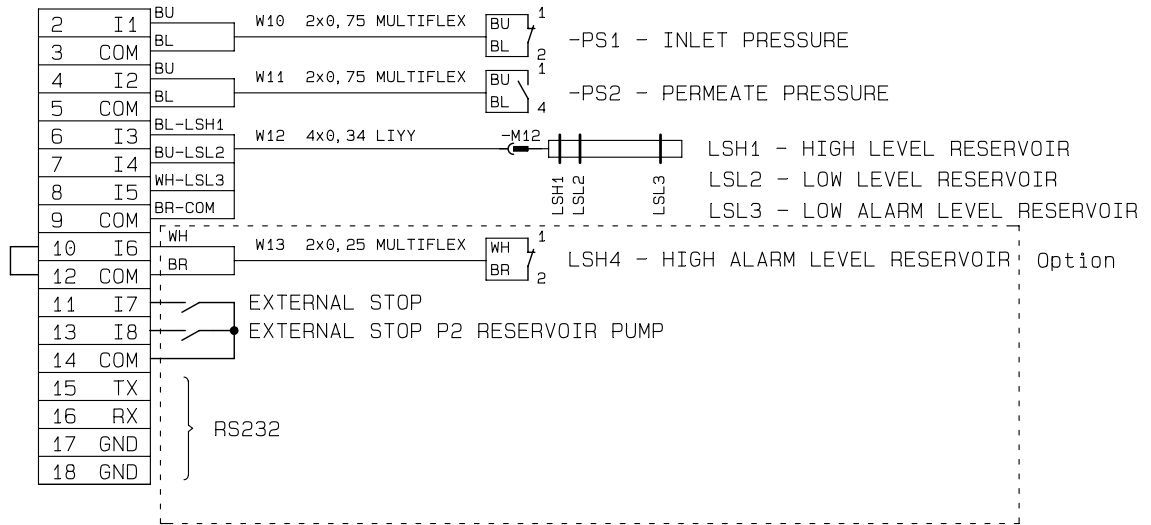
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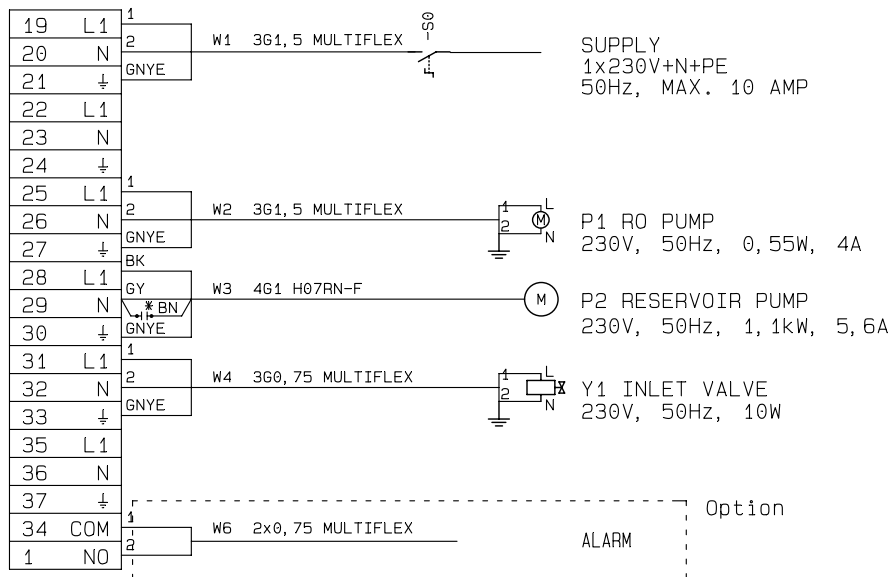
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64 ( 000 )

# INPUT



# POWER



\* CONDENSATOR : 20µf/450 VDB

R051, 100, 270  
Electrical connections

Appr	24-09-2008		
Rev			
Drw	16-02-2007	HO	JRI
Date		Ass.	Appr

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S347	1



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64(000)



### 13.4 Servicing and Maintenance Table

Servicing and maintenance of RO-270 R plants	Every day	Every week	Every 5- 8 weeks	Every 25 weeks. (or as required)	Every 52 weeks
	(Not standard) Check up of soft-water supply (soft water < 0.5°dH)				
	Check-up of permeate capacity can be read on flow meter (F-figure 3) while plant is operating. Check-up of UV lamp.				
	Check-up of operating pressure. Can be read on manometer (E-figure 3) while plant is operating.				
	Check-up, disinfection and cleaning of plant and reservoir tank.				
	Cleanign of membrane(s) or sooner at 10 % capacity decrease				

### 13.5 Operating Journal

[illegible]

**13.6 Spare-parts list RO-270**

Item No.	RO-plant	Recommended spare parts	Article No.
01	Cover		
02	Cabinet complete		451202033
03	Rails		451202345
04	Air intake		451202330
05	Overflow nozzle		405100730
06	5" filter housing		321400000
07	5"-5 $\mu$ filter cartridge	2	321410000
08	Pressure switch 0.5 bar	1	452550005
09	Solenoid valve $\frac{1}{2}$ "	1	200752004
10	Manometer 0-40 bar	1	452266000
11	$\frac{1}{4}$ " needle valve 3.0 mm	1	200731010
12	$\frac{1}{4}$ " needle valve 3.3 mm	1	200731002
13	Snap-on coupling 10 mm elbow	1	454090010
13-A	Snap-on coupling 12 mm elbow	1	454090012
14	Snap-on coupling 10 mm tee	1	454095010
15	High-pressure motor		451202410
16	High-pressure pump		451202406
17	Connector for high-pressure pump	1	451202450
17-A	Rubber connector		451202435
18	Flow meter, permeate		453010002
19	Plastic fitting (flow meter)		061282021
20	Level sensor no. 3	1	451404435
20-A	Cable no. 6 for level sensor 1.5 m	1	451404450
21	Vibration damper		451202302
22	Reservoir pump - 230 Volt		454100710
23	Danfoss push button, KPI 0.2-8 bar	1	451202802
24	Distribution system		451202214
25	Hydrophore		451404570
26	Piping suction rod		451202220
27	Non-return valve/bottom valve		200320032
28	Control panel complete		451404406

Item No.	RO-plant	Recommended spare parts	Article No.
	Membrane/pressure tube		
30	Pressure tube		451202069
31	Membrane	1-4	451202040
32	U-lock		451202120
33	Lipring for membrane		
34	O-ring outside (large)	4-16	451202212
35	O-ring inside (small)	4-16	451404215
36	Snap-on coupling 10x¼", base	1	454065010
36-A	Snap-on coupling 12x¼", base	1	454065012
37	Endplate	1	451202117
40	Membrane flush		451202860
	Various		
-	10 mm plastic hose	1 m	454001010
-	12 mm plastic hose	1 m	454001012
	Option		
-	Filter housing 10" complete		321401000
-	Filter key		321417100
-	Carbon filter 10"		321413000
-	Sensor (conductivity meter)		452536006
-	Conductivity meter		452525000
-	CIP tank complete		451404573



EC Declaration of Conformity  
for Machinery  
Directive 98/37/EC, Annex II, A  
Low Voltage Directive  
EMC Directive



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herewith declares that:

- **RO 271, 272, 273, 274**
- is in conformity with the provisions of the Machinery Directive (directive 98/37/EC)
- is in conformity with the provisions of the following other EC directives
- Low Voltage Directive (73/23/EEC)
- EMC Directive (89/336/EEC)
- Place: Greve, Denmark
- Date: 01-01-2006

A handwritten signature in blue ink, consisting of several loops and a long horizontal stroke.

Signature

Name: Lars Jensen

