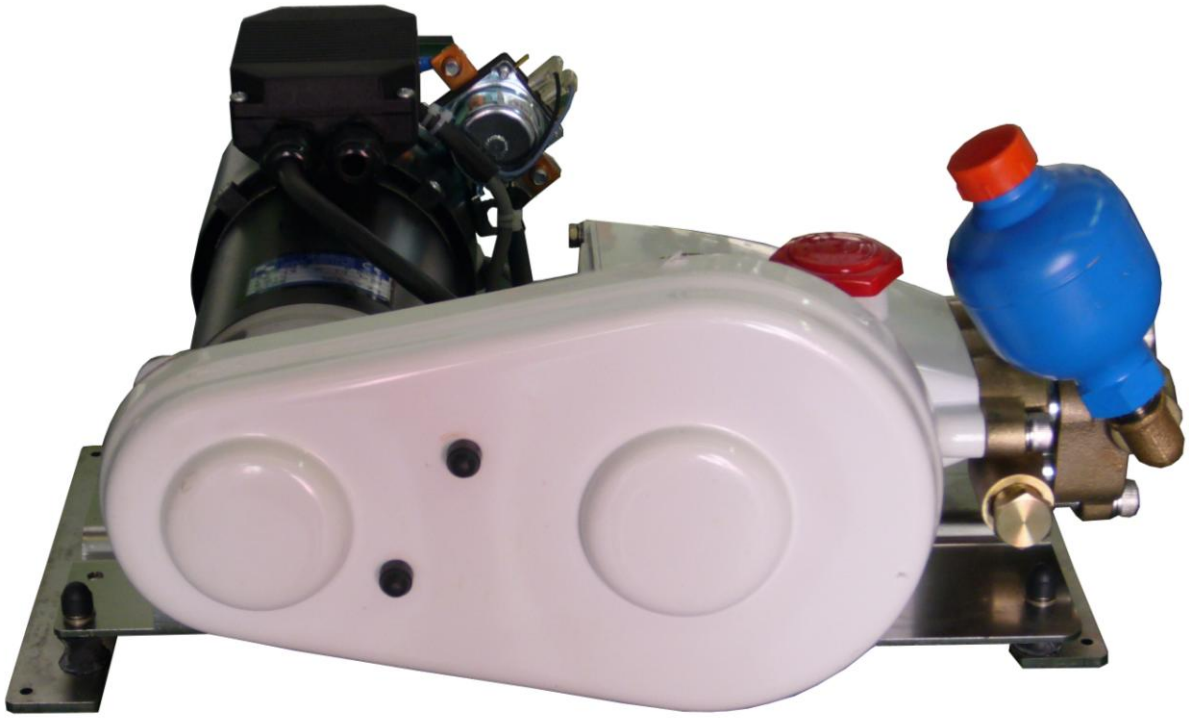
USER'S MANUAL
DESSALATOR® 100 LITRES / HOUR – 12 or 24 V



DESSALATOR

Technical and Sales Departments :
Z.I des 3 Moulins – 282 rue des Cistes "Euro 92 – Bât. D – rue des Cistes
06600 ANTIBES - FRANCE

Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
e-mail: dessalator@wanadoo.fr
Web site: www.dessalator.com

Version A3

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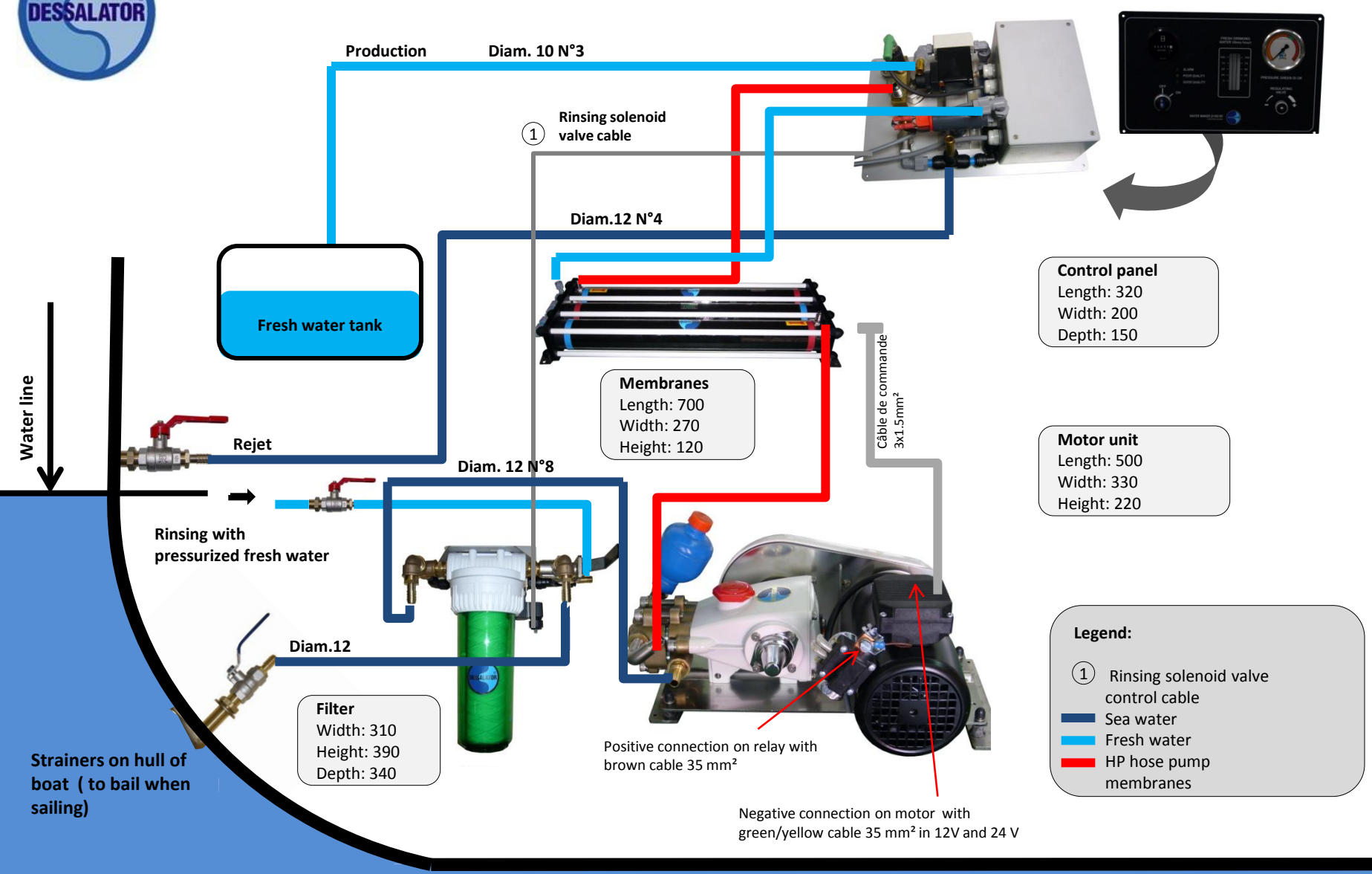
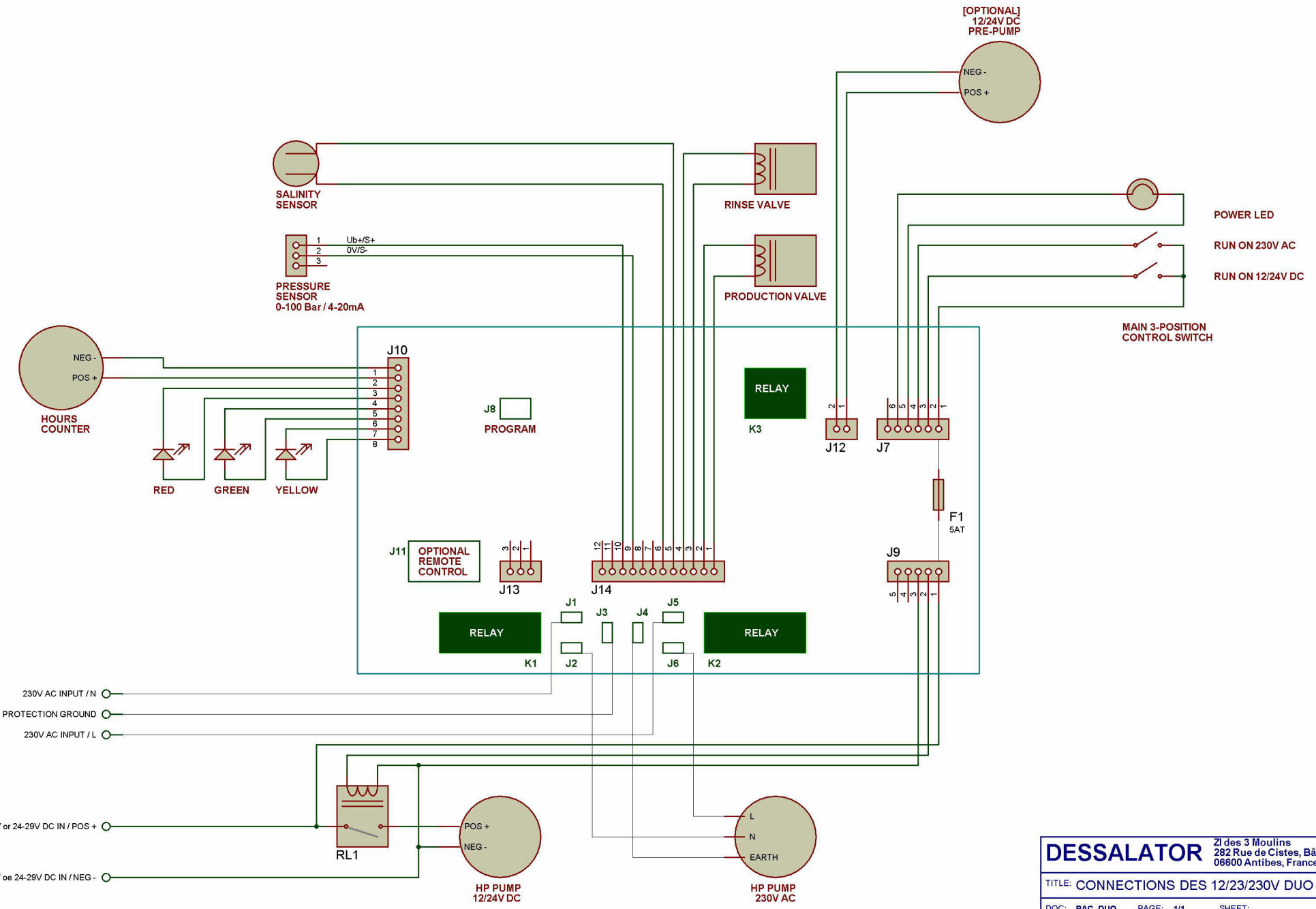


DESSALATOR, Z.I. des 3 Moulins – 282 rue des Cistes - Bât« Euro 92 » D, 06600 Antibes
Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 e-mail: contact@dessalator.com



DESSALATOR

ZI des 3 Moulins
282 Rue de Cistes, Bâtiment Euro 92
06600 Antibes, France

TITLE: CONNECTIONS DES 12/23/230V DUO

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GREENTRONICS BV - THE NETHERLANDS

1. Components supplied with the Dessalator®:

Version A3

Hull valve:
It must be located the lowest possible in the boat, to the back for a motor yacht or in the centre near the keel for a sailing boat.
The hull valve strainer filters out the larger particles at system entrance.

Pre-filter:
It must be located the nearest possible to the hull valve and be compulsory under the waterline. If not possible, there is a solution: Install a LP pump (optional).
The pre-filter filters out solid particles down to 5 µm at the motor unit inlet. It is supplied with wrench.
For automatic rinsing an electro-valve is mounted.

Motor-Pump unit:
It must be located compulsory under the waterline
The motor-pump unit is comprised of the 12 or 24 V motor and a high pressure pump.

Membrane unit::
The membrane unit includes 3 membranes 2521 assembled in a compact frame.

According to the model, a fuse or a circuit breaker is supplied.

Control panel:
includes a HP gauge, a flowmeter, an on/off switch, a pressure adjustment knob, an operating time meter, 3 indicator lights.

Pipes and hoses supplied by Dessalator®:

- High pressure pipes pump/membranes and membranes/control panel (2 pipes and 4 special connectors)
- Water production pipe membrane / control panel.

Additional hardware needed for assembly:

- Miscellaneous screws (including Parker)
- Stainless jubilee clips ∅ 10 and ∅12
- Assortment of plastic rings (tie wraps)
- Teflon tape or insulating water proof tape
- Silicon Rubson mastic, Sicaflex or equivalent
- Ribbed insulating pipe for cables and HP tubes
- Tricoflex hoses ∅ 10 and ∅ 12
- Power cable: 50mm² for the 12V and 20mm² for the 24V
- Various tools (electric drill, saw, …)

2. How to install the watermaker:

2.1 Sea water inlet

Sea water inlet valve:

The strainer should be positioned as low as possible below the waterline and as far as possible from the deck waste oulet. Drill the hull ∅ 21mm. The grooves on the strainer should be facing forward (towards the bow) for maximum water intake when the boat is moving forward. Please seal watertight with Rubson mastic or Sicaflex and ensure that the immersed part is painted with underwater grade paint.
The hull valve should be accessible for maintenance. Make the valve / strainer and valve / hose connector watertight using 577 Loctite or Teflon tape.

Cartridge pre-filter:

The pre-filter should also be positioned as low as possible below the waterline and it should remain accessible. The mounting bracket is reversible, which facilitates the height positioning. The hose connection must be done with 12mm inner diameter Tricoflex for all the sea water circuit and the pressurized rinsing. Don't forget to place two stainless steel collars on each connection. 5cm space should be left below the filter body to allow the filter basin to be removed. A wrench is supplied to dismantle the filter. The fresh water pressurized rinsing must be connected to the output of your board pump. An electro-valve is mounted on the output (diam. 12) for automatic rinsing. It can be connected under a sink, a wash basin or on the way of pressurized cold water hoses. The valve handle must be positioned to the front when the water maker is working. For a manual rinsing, please move the valve handle to the back. When replacing the filter cartridge, please check that the O-ring seal for the basin is secure and that the bleeder screw is tightened and fill the circuit with fresh water again for 3 to 4 minutes, put then the handle to the front.

Connections:

Hull valve / three-way valve, Pre-filter / pump, Fresh water / three-way valve, rinsing electro-valve
The sea water inlet valve should be connected to the pre-filter using a tricoflex hose of inner ∅ 12mm, for sea water circuit and rinsing under pressure. Mount two jubilee clips at each joint, with their tightening heads positioned diametrically opposite on the hose. Connect the pressurized fresh water from the water oulet to the three-way valve. This connection can be made under a sink, wash basin or anywhere on the length of the pressurized fresh water pipe. When operating in sea water mode, the valve handle should be positioned in line with the filter (see photo above).

Recommendation:

If the pipe must pass through dividing walls or touch sharp edges, use an insulating pipe or tube superior to the pipe diameter to protect it against wear and friction.

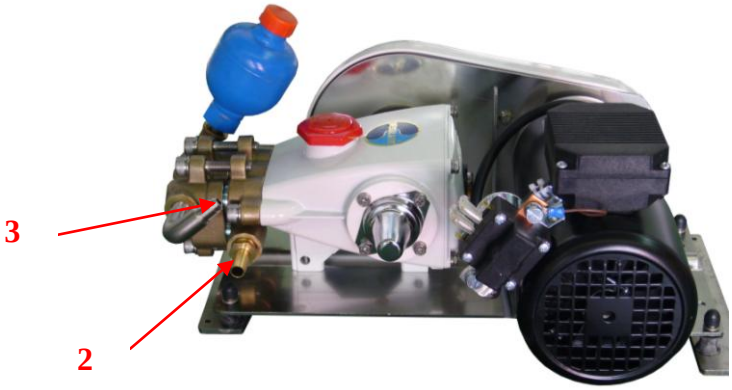
2. How to install the desalinator:

2.2 Motor unit:

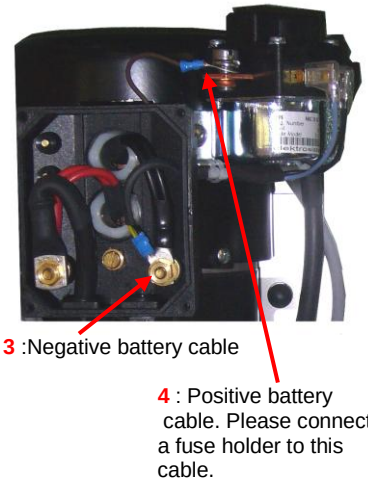
The HP motor unit should be installed as low as possible in the boat in a horizontal position and it must be protected from water spray as much as possible. The unit is mounted using two brackets under the two motors leaving a few centimetres clear space around the unit, to get sufficient air circulation space for motor cooling. The connection between the prefilter[1] oulet and the inlet to the low pressure side of the pump[2] is in Tricoflex hose of ∅ 12mm with doubled stainless jubilee clips at each joint.

The HP head[3] of the pump is connected to the membrane inlet (red mark) through an HP pipe, cut to the appropriate length (see installation of connectors appendix A2).

Apply a little liquid Loctite or nut seal on the male and female cones before joining.



2.3 Electrical connections:

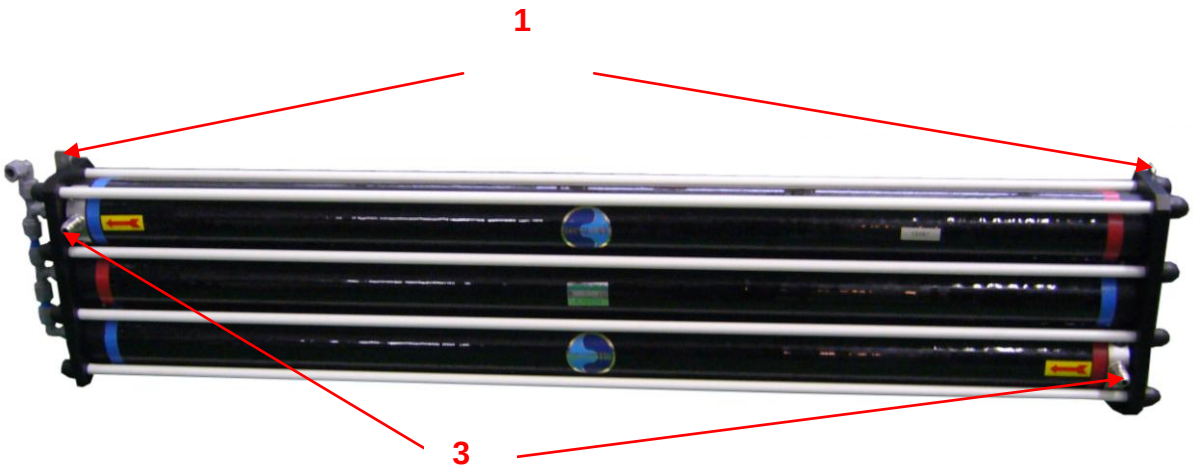


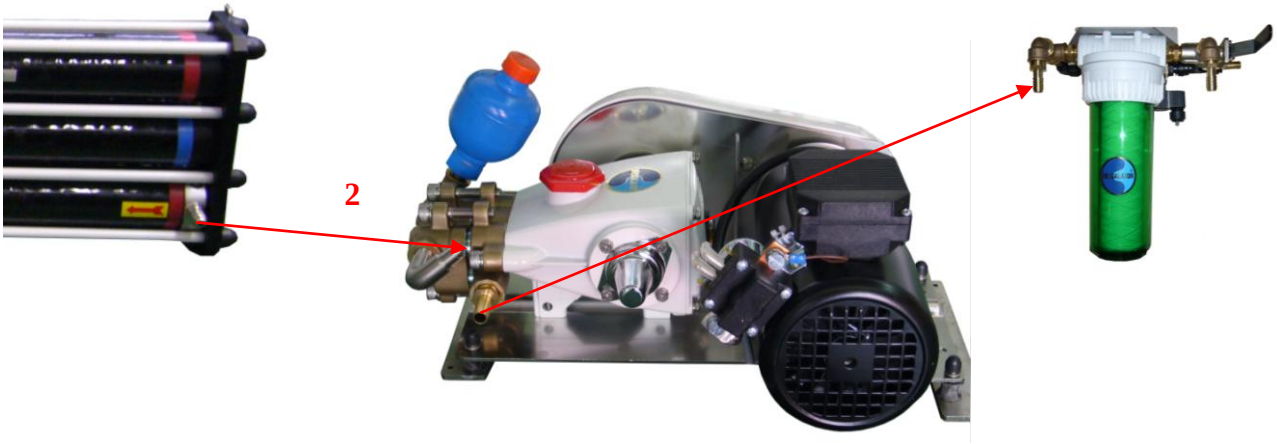
CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

When connecting the 12 or 24V motor ensure that the polarity is correct: positive (brown wire[3]) on the relay and negative (yellow wire[4]) on the 12 or 24V motor. Depending on the voltage install a 12V fuse holder (supplied) or a 24V circuit breaker (supplied) on the positive cable. Ensure that the cable is of sufficient diameter: 50mm² for the 12V or 35mm² for the 24V. The Dessalator control cable is 5m long and is equipped with a plug with a pin locator system. The Dessalator® can only be operated when the power cable is connected to a DC supply.

2. How to install the desalinator:

2.4 Membrane unit



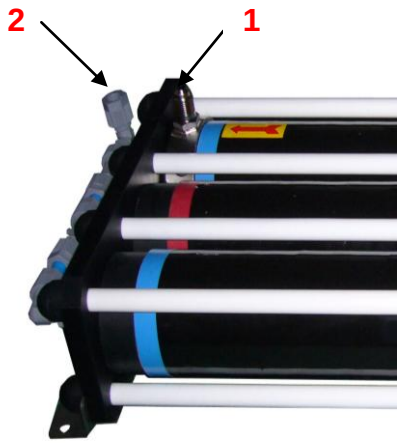


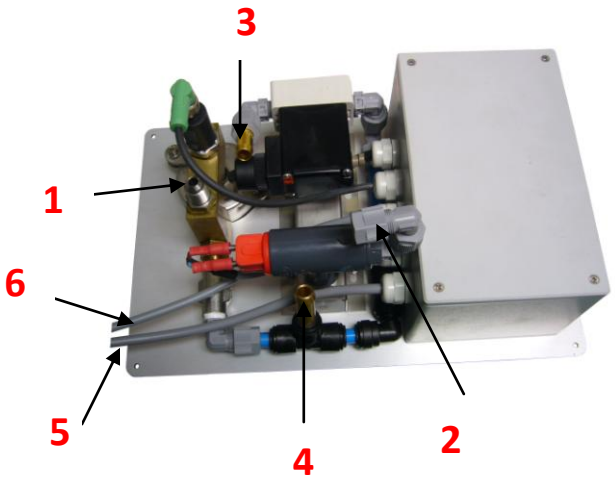
The membranes can be installed horizontally, preferably flat or on a wall support. They are mounted using 8 Parker screws in *stainless steel brackets*[1]. As the hose from the HP pump[2] vibrates, it is preferable to install the hose with an insulating tube. The HP connectors should be installed strictly in accordance with the instructions (Appendix A2). Apply a little loctite or nut seal to the two male and female cones before tightening.

Recommendation: To facilitate the connection[3], it is possible to rotate the heads through 90° by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Remove the rod to obtain access and rotate the membrane head using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the assembly.

2. How to install the desalinator:

2.5 Control panel:





The control panel must be mounted on a vertical surface as close as possible to the motor / pump unit and to the membranes. Leave space behind the panel to facilitate the connections. It is recommended that it is installed at the bottom or on the sides of cupboards, under chart table or main cabin seats, on the front panel of a rear bunk, …

The panel has the following water connections:

- HP hose[1]
- Production hose exiting the membranes (blue hose)[2]
- Production hose from panel to tanks[3]: a 10mm inner ∅ Tricoflex hose will be required which must be connected either to the fresh water tanks or to the distribution manifold on the fresh water unit inlet provided there is no constricting valve on the fresh water tank outlet.
- A Tricoflex waste oulet inner ∅ 12mm hose[4] will also be required which can be connected to a sink, wash basin or cockpit water drain, to avoid having the hull redrilled. If this is not possible, remember to open the outlet valves before using the Dessalator.

Electrical connection:

- The 12 or 24V motor power cable[5] with a connector[5] and pin location system is connected to the cable exiting the 12 or 24V motor.
- The solenoid valve is connected with cable[6].

3. Starting the Dessalator®:

1. Ensure the valves are open before starting up the desalinator (Hull valve and waste oulet valve if relevant)

2. **To be done compulsory:**
   For the first use, after the replacement of the filter, when lifting the boat out of the water or for a long period of not using your water maker, please fill the circuit with fresh water: put the handle valve on the pre filter to the back; this operation should be done for 3 or 4 minutes, water maker stopped and pressure captor open (fully anti-clockwise). Once the circuit is full of fresh water put the valve handle of the pre filter to the front.

3. It is important to take account of the ampere capacity of the batteries and of the working duration: for a use without any risk, it is better to start the motor of the boat.

4. To start the water maker, the pressure regulator must be open. Switch on.

5. Turn the pressure regulator dial to the right until the HP gauge reading is in the orange zone then gradually adjust until the needle reaches the beginning of the green zone. Check that the pressure remains constant. The purpose of this operation is to remove air from the system and to obtain a more constant pressure while the water maker is running.

6. Fresh water quality and flow into the tank is automatically monitored by the electronics board.

7. If pressure becomes too high the water maker will cut out and the red indicator will light up. If this occurs, reduce pressure, switch off and restart the water maker.

8. To shut down the water maker: switch off then reduce pressure.

9. To shut down with rinsing, please see page 8 and 9.

10. If the water maker is not used for extended periods of time it should be rinsed preferably once a month. If not, the membranes will have to be sterilized for the storage (for 6 months).

Note: Fresh water production depends on the temperature of the sea water and on the cleanness of the 5µm pre-filter.

4. Directions for use:

MEMBRANES DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of the system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the desalinator is achieved with a sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water and the sailing area. Output drops by approximately 2.5% to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C. Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid either sea water before treatment, fresh water provisionally stored or sterilizing liquid if the desalinator is not used for extended periods of time (See sterilization methods appendix A3). Sterilizer is effective for six months and must be replaced after this period of time.

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the desalinator in Marinas. **The system is not recommended for use in muddy or polluted water (briny water, river, Red Sea)** , which can clog the pre-filter and damage the membranes. However, if the desalinator has to be used in such conditions only run it for very short periods, as soon as clean sea water becomes available rinse the membrane and run the system without pressure for 30 minutes with the pressure regulator open.

5. Maintenance:

CAUTION: IN FREEZING CONDITIONS, PLEASE EMPTY THE FLOWMETER TUBE ON THE CONTROL PANEL BY DISCONNECTING THE PRODUCTION HOSE AND BLOWING OR INJECTING AIR INTO THE HOSE, PROTECT YOUR MEMBRANES WITH BLANKETS.

5.1. Maintaining the membrane

After 1,000 working hours, it is normal that the flow lowers between 10 and 15%. If more, you should think of replacing the membranes.

- The volume of production of your watermaker can be made over the first 24 to 48 hours of operation. If the drinking water produced falls below the normal working specifications (sea water containing a TDS of 35,000 ppm, a sea water temperature of 25°C, and pressure of 65 bars), and if production is not improved by rinsing the membrane, then the membrane has to be replaced.

- Please take into consideration that the volume of drinking water produced is dependent on ideal sea water temperature and on pressure in the system. Therefore, if the volume of drinking water produced falls it does not necessarily mean that the membrane need to be replaced.

5.2. Rinsing the membranes

Once a week, the water maker needs to be flushed with fresh water before using it to make fresh water. There is no need to flush it with fresh water after each use, as this is just a waste of water that are taken from the boat's tank.

There are 2 methods to flush the system: manual and automatic.
Both systems are using the water that are in the tanks of the boat, and there is no use in water from the dock or a connection of any hose from a source outside the boat.

Remember: <u>The biggest enemy of the membranes is fresh water.</u>

Fresh water should be always used with no pressure when going through the system (pressure dial turned all the way anti clockwise) and the system should always run with no pressure after a fresh water flush to dump all the fresh water that are in it, before making freshwater from sea water (also with the pressure dial all the way anti clockwise).
When running the watermaker with the dial all the way anti clockwise, it will shut it self down automatically after 1 minute. Only then, the watermaker is ready for use.

5. Maintenance:

Manual Flush

Next to the pre filter there is a valve. The valve is connected to the fresh water system of the boat and turning it, will automatically start the boat's water pump and a flow of fresh water from the tank to the water maker.

1. **Don't turn the water maker ON**. Leave it on it's OFF position.
2. Turn the pressure dial all the way anti clockwise.
3. Turn the valve of the fresh water intake, which is located next to the filter, for 2 minutes. The boat's water pump will start and fresh water will run through the water maker.

Automatic Flush

After using the water maker, don't switch it off.

While the water maker is still running, turn the pressure dial all the way anti clockwise. The water maker will stop making water and will automatically start the flushing process. The green and orange lights on the control panel will turn on, which indicates that flushing is in process. This should take 30 seconds and will stop automatically. The green and orange lights will shut off and the only indicator will be the blue flashing light on the ON/OFF button, to remind you to shut the water maker OFF.

The automatic flush is a better way to flush the system since it's not only flushes the sea water out, it also back wash the pre-filter and dumps all the dirt and debris that accumulated in the filter's housing, back to the sea, through the sea water intake.

DON'T FORGET!!!

After each system flushing, before using the water maker you need to:

1. Make sure the pressure dial is turned all the way anti clcockwise.
2. Turn the water maker ON and let it run with no pressure for 1 minute until the red alarm light comes on. This is the time needed for the sea water to replace all the fresh water that are in the system, before running pressurized sea water through the membranes.

RUNNING FRESH WATER IN HIGH PRESSURE THROUGH THE MEMBRANES WILL DAMAGE THE MEMBRANES!!!

5. Maintenance:

5..3. STERILIZING THE MEMBRANE

When should the membrane be sterilized?

Normally, regular monthly rinsing of the membrane may be all that is required to maintain the membrane. If this is not possible, sterilization will be necessary. A sterilisation procedure should be carried out every six months.

Membrane sterilizing procedure:

1. Manual method: Thoroughly rinse the desalinator with fresh water for 10 minutes, using the three-way valve on the pre-filter. This procedure should be followed while the machine is idle. Pour the sterilizer (entire packet contents) into a bucket containing 8 litres of water. Disconnect the sea water inlet hose and immerse it in the bucket. Run the desalinator without increasing pressure until the bucket is empty. When the bucket is empty and the procedure is completed, the hose can be reconnected. If not, see number 3.

2. The sterilizing procedure can also be carried out using a garden spray: Pour the entire packet contents of sterilizer into a bucket containing 8 litres of fresh water and mix thoroughly. Fill the spray bottle with this mixture and spray the sterilizer into the water maker inlet, at a spray pressure of 3 to 4 bars. If not, see number 3.

3. Sterilizing cartridge ST2:
   We have developed a sterilizing cartridge which makes this procedure very simple and easy. Cartridge instructions are given in appendix A3. Before using the desalinator again simply rinse with fresh water for a few minutes using the three-way valve on the pre-filter and all traces of the sterilizer will be removed.

5.4. HP Pump

The HP pump is half filled with oil to the indicated level on the gauge. Normally no additional oil is needed throughout the life of the water maker. However, if refilling is necessary, use multi grade oil 15W40 and do not exceed the indicated level (in the middle of the red mark on the gauge which is on the back of the pump to the opposite of the pump head).

BEWARE: the sticker located on the red oil filling cap of the HP pump is there only for the shipment: it must be removed before use.

6. SPARE PARTS AND ACCESSORIES

Spare parts

Dessalator® systems are very reliable, hardwaring and do not generally require expensive services. Nevertheless an accident is always possible (running without enough water, accidental overpressure, impact,…).

Should the need arise, we supply spare parts and maintenance accessories:

- 5µm 10 ft filter
- driving belt
- motor relays
- production solenoid valve
- HP pump seals and valves
- HP hose (sold by meter)
- Connector for HP tube
- Flowmeter tube

Accessories:

- Sterilizing cartridge ST2
- Sterilizer bag
- Mineralizing cartridge

APPENDIX – A1
Reverse Osmosis

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membrane. This waste, along with the remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids); approximately 2% of the 35,000 PPM/TDS will pass through the membrane. This guarantees drinking water with a TDS value of 500 (average). Please note that the drinking water produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with a slight dose of chlorine (or iodine) and it should be also mineralized to ensure it remains consumable. Pay attention not to allow pure chlorine (or a too high dose of chlorine) into the desalination system, as this could damage the device.

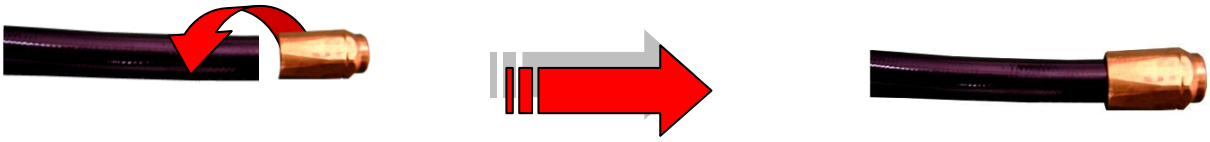
How does your desalinator work?

Sea water enters the inlet valve which penetrates the hull. This sea water is then routed through the 5 µm pre-filter. The filtered water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurised water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: If the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity > 1,000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel. The production capacity of fresh water is achieved with a sea water temperature of 25°C. The output drops by approximately 2,5 to 5% for each degree below 25°C.

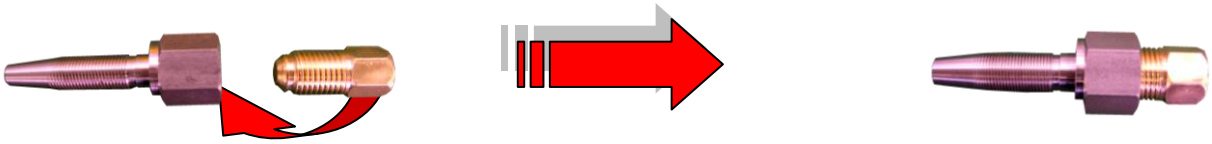
APPENDIX – A2

Installation instructions – HP Connectors

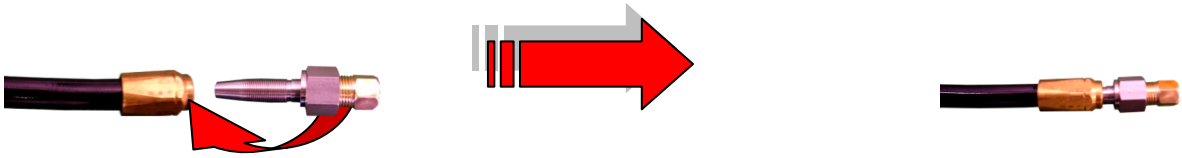
1. Screw the brass union (skirt) anti-clockwise onto the HP pipe, no more than 2.5cm. Stop where the inner threading disappears.



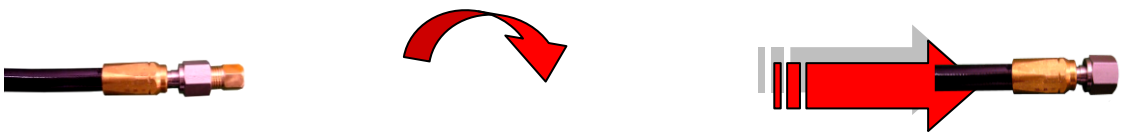
2. Insert the steel tapered end-piece into the stainless steel nut, and tighten very firmly on the male tapered union.



3. Lightly grease the tip of the stainless steel cone and screw it straight into the brass union. Stop where the steel threading disappears into the brass end-piece (a gap of approximately 7mm between the nut and the brass union)



4. Unscrew the nut of the tapered adaptor. The connector is now ready for the hose from pump to membrane. We recommend using an insulating pipe to protect it against vibrations.



5. IMPORTANT: Check carefully that the end-piece does not block the hose:

- Please don't forget to put Loctite or watertight product on the male and female cones when remounting.
- Please check that the HP connector is not blocked up.
  - either by blowing into the hose
  - or by inserting a screwdriver to check free passage.

APPENDIX – A3

Sterilizing cartridge – instructions for use

The desalinator is not running:

1. Close the sea water inlet valve.
2. Open the sterilizing cartridge
3. Remove the top grid
4. Place the foam filter at the bottom of the filter
5. Pour the powder into the cartridge
6. Replace the top grid and close the cartridge
7. Check that the seal is properly positioned.
8. Dismantle the basin of the pre filter
9. Remove the 5µm cartridge from the pre-filter.

Remove the 5µm cartridge from the pre-filter

10. Replace with the sterilizing cartridge ST2

Replace the 5µm cartridge with the sterilizing cartridge ST2

11. Set the rinsing valve to pressurized fresh water and rinse, leaving a little sterilizer in the filter.
12. At this point, the desalinator must be switched off
13. The sterilisation remains effective for six months at most. (Repeat after this time as necessary).

Caution: Before next use, rinse the desalinator thoroughly with fresh water for 15 minutes and ensure that the sterilizing cartridge has been removed and replaced by a 5 µm cartridge.

BEWARE: The ST2 cartridge is reusable.

APPENDIX – A4

Your DESSALATOR® is equipped with an automated rinsing.
Please find her below the procedure if you wish to rinse it manually.

MANUAL RINSING

Your Dessalator® is equipped with an automated rinsing.
Here below the procedure to rinse manually.

Manual rinsing and sterilization:
Valve handle to the back.

Normal position for a use with sea water:
Valve handle to the front

APPENDIX – A5

Troubleshooting

PROBLEM	CAUSE	SOLUTIONS
Leak on the pressure regulator in front of the control panel	Loosened regulation cable gland	Tighten the cable gland with a 12 wrench.
Noisy HP pump.	- Reduced water inlet or air inlet in the system. - Leak on pump head seals.	- Ensure correct size of hoses (diameter), clips and filters secure and filters clean. - Replace seals.
Oil leak on HP pump	Worn seals on connecting rods	- Replace the seals.
Insufficient water flow	- Very cold water - Dirty pre filter - Tension drop on the power cable	- Replace the pre filter - Recharge batteries - Check the connection. - Inadequate power cable section, reinforce cable section.
Water leak under the HP head	- Worn seals	- Replace plunger seals
No pressure reading	Insufficient water	Open the hull valve and / or the rinsing valve
Pressure doesn't come up.	Dirty pump valves	Dismantle and clean the valves in the pump head

APPENDIX – A5

Troubleshooting: led indicator

USER'S MANUAL
INSTALLATION OF A DESSALATOR 440 TO 1,000 LITRES / HOUR IN 400 V – EARTH APPLICATION

BEWARE: DO NOT LIFT BY CHASSIS!

DESSALATOR

Technical and sales departments:
Z.I des 3 Moulins – « Euro 92 » – Bât. D – rue des Cistes – 06600 ANTIBES

Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
Email: contact@dessalator.com
Web Site: www.dessalator.com

DESALINATOR 440 TO 1,000 LITRES / HOUR

CONTENTS

THE PURITY OF INNOVATION AS WELL

DESSALATOR INNOVATES

Dessalator adapts its unique sea-water desalination designs to all types of land-based constructions.

The principle behind this process is to improve considerably both comfort and hygiene in living quarters whilst generating life-long savings on water. Dessalator has 25 years' experience in fitting out accommodation on the water's edge as well as constructions that are more difficult to access; the equipment is designed, manufactured and installed by the company's engineers and technicians.

Dessalator has designed a system that caters for your various daily domestic needs. It provides a continuous supply to reserve tanks, can be used for automatic watering in the garden, for filling and daily maintenance of swimming pools...

With a wide range of watermakers from 200 l/hr, Dessalator is able to provide you made-to-measure units.

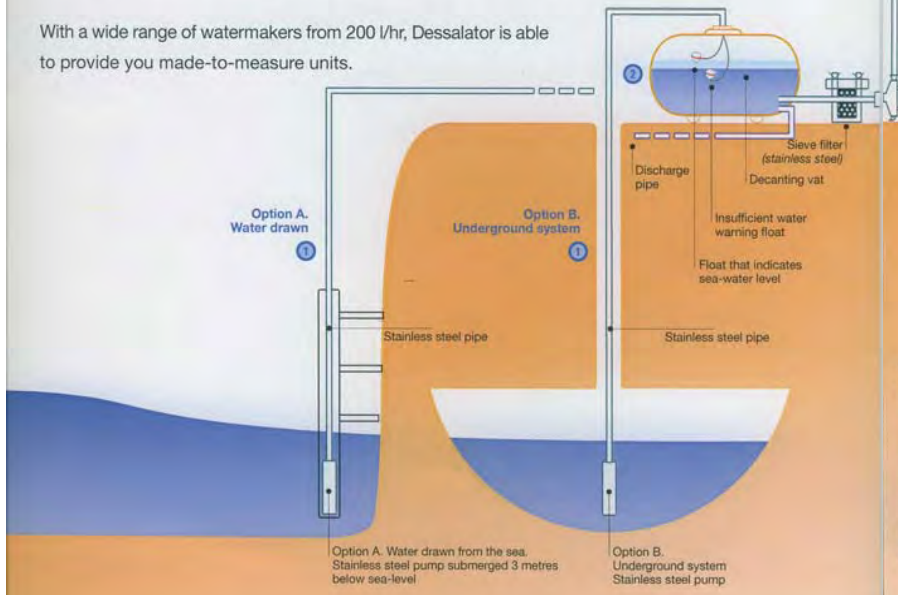
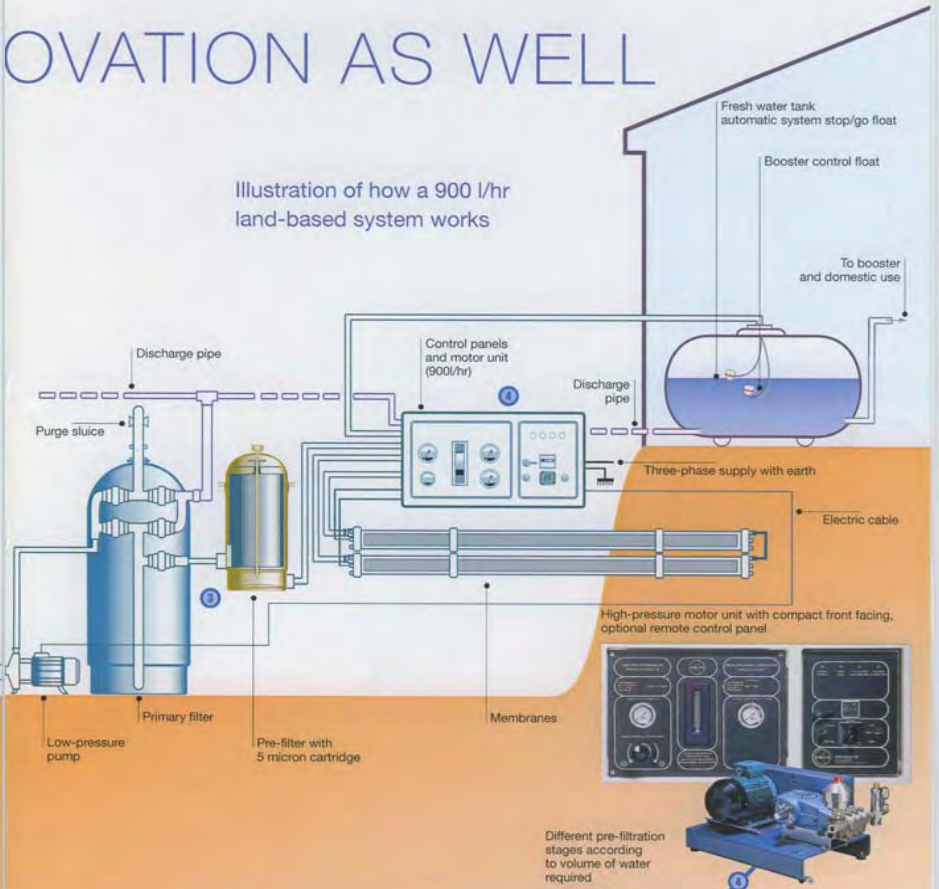


Illustration of how a 900 l/hr land-based system works



2. COMPONENTS SUPPLIED BY DESSALATOR ACCORDING TO THE CHOOSEN MODEL:

Pre pump:

It enables water to flow through the pre filters to the HP motor unit.

Pre-filters:

Stainless steel pre filter - multi cartridges 25 µm 10 Inch (x5): it allows a first filtration. It is supplied with an anode in its cover.

Stainless steel pre filter - multi cartridges 5 µm 10 inch (x5): it allows a filtration up to 5µm; It is supplied with an anode in its cover.

Motor unit:

HP motor, fixed on a frame with silent blocks.

Control panel

HP motor unit

Control panel:

The control panel manages the functions of the water maker.

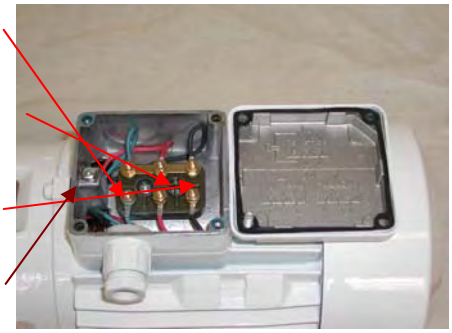
WATER MAKER - 440 TO 1,000 LITRES / HOUR
3.1 Installation instructions

Pre pump:

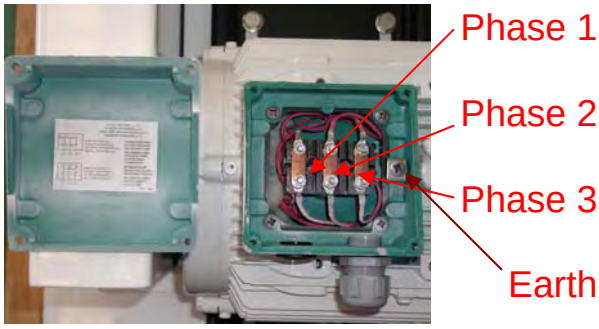
The pre pump with its rinsing valve[3] and its pre filter should be installed in charge and the pressurized fresh water should be connected to the valve.
Beware: Please check the rotating direction of the pre pump when starting up the machine.

THE PRE PUMP SHOULD NOT BE PLACED WHERE THERE IS A RISK OF WATER SPRAY.

Pre pump cable case 400V
LP Pump
(threephased motor 240 / 400)
Beware: Check the direction of rotation



Pump cable case 400V
HP pump
(Motor 400 / 660V)

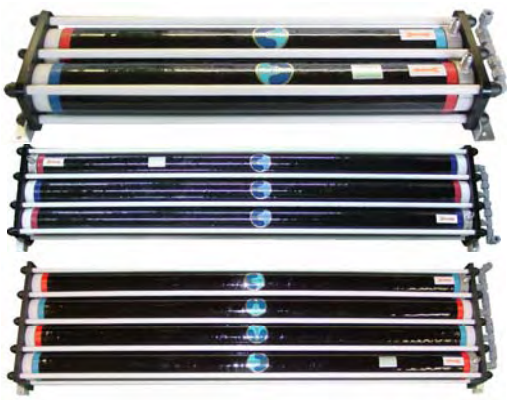


CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

PLEASE DO NOT FORGET TO CONNECT THE CHASSIS TO EARTH ON THE SCREW LOCATED ON THE FRONT PANEL!

WATER MAKER - 440 TO 1,000 LITRES / HOUR
3.2 Installation instructions

Membrane(s), according to desired water flow:



2 membranes for 440 litres / hour water production.

3 membranes for 660 litres / hour water production.

4 membranes for 1000 litres / hour water production.

The number of membranes used depends on the desired water flow. Le nombre de membranes est fonction du débit souhaité. Hose from the HP pump should join the membranes at the red ring[1].

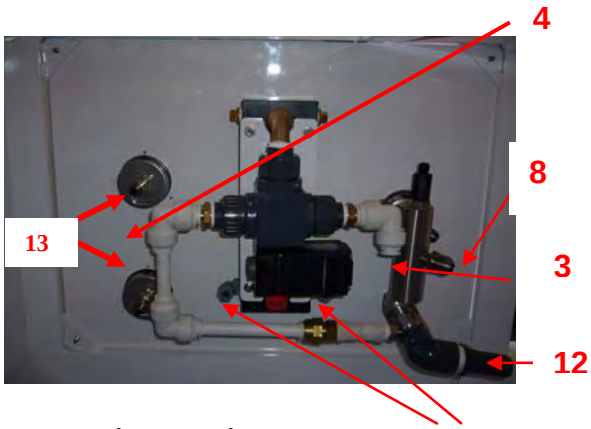
Recommendation: To facilitate the attachment to the HP stainless steel joins[2], it is possible to rotate the heads through 90°, by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Then remove the rod to obtain access, and rotate the membrane end cap using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the unit.

WATER MAKER - 440 TO 1,000 LITRES / HOUR
3.3 Installation instructions

Panel photographs:

Beware: The handle is in the electric connection box (Security for shipment)

Front panel



Back panel

Figures for each connection are as follows:

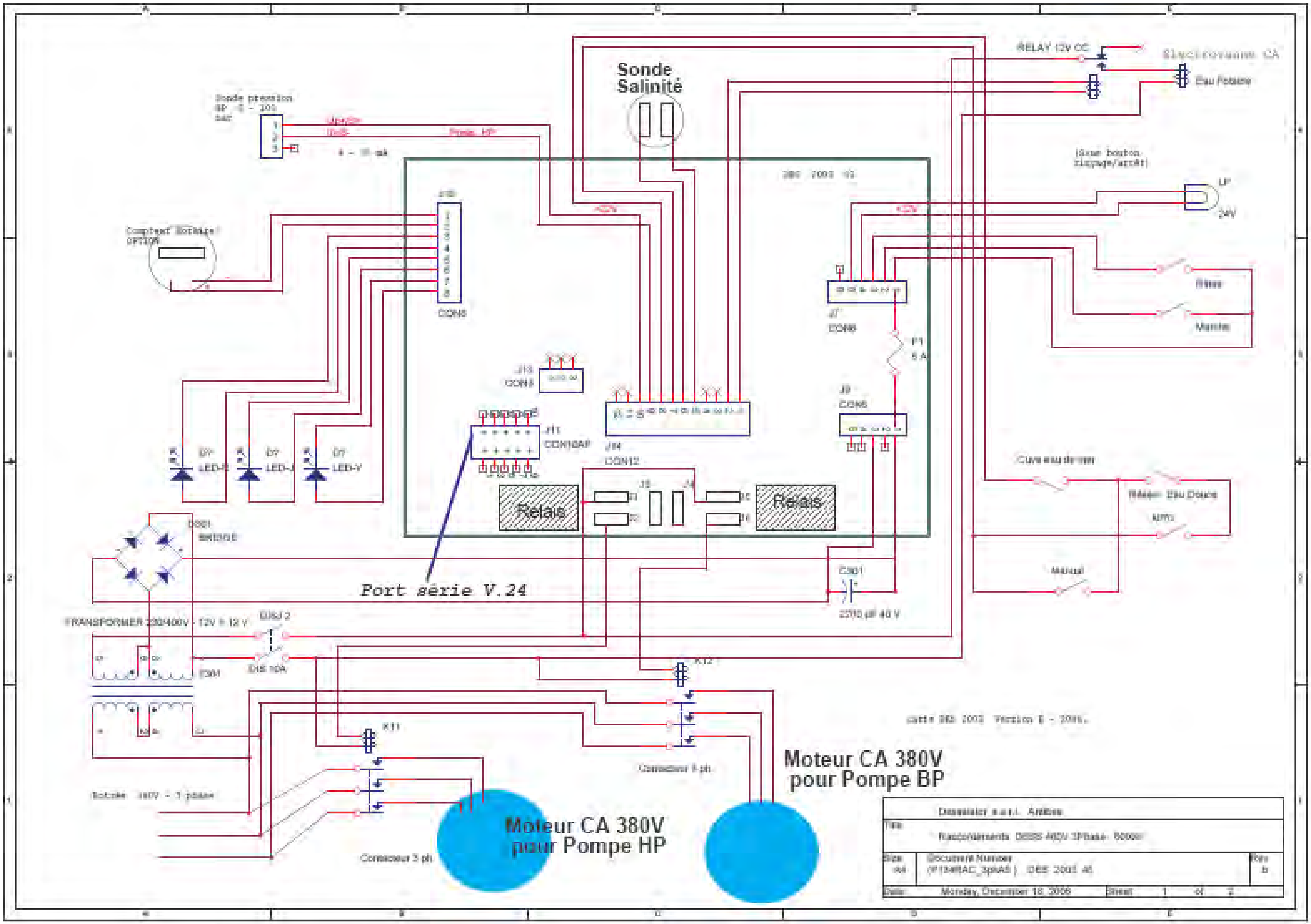
- N°8 (blue): HP piping exiting the membranes.
- N°6 (blue hose 8/10mm diameter): Production hose exiting the membranes.
- N°3: Production hose from panel to tanks. A 15mm inner diameter Tricoflex length will be required which should be connected either to the fresh water tanks or before the fresh water pump, provided there is no constricting valve.
- N°12: Waste outlet: 15 mm inner diameter Tricoflex.
- N°4: 4mm capillary hose to be connected to the exiting side of the HP stainless steel 5 µm pre filter HP; it indicates on the low pressure gauge the dirtiness of the stainless steel pre filter (6m are provided).
- N°13 : 4mm capillary hose to be connected to the entry side of the stainless steel pre filter; it indicates the dirtiness of the sand pre filter.

  In the case of installing a mineralizing filter, it should be located on the production hose to the tanks.

HP motor unit:

There are two water connections to the pump head:

- A ¾ diameter pipe[1] from the pre filters.
- A 19 mm diameter HP hose[2] to the membranes.
- Two capillary hoses are connected to the stainless steel pre filter; To disconnect them, please push the black collar and pull the hose at the same time. The HP unit should always be installed horizontally. Do not place it where there is a risk of water spray. The connection should be done as on the scheme below.



Sonde Salinité
RELAY 12V CC
Eau Potable
Sonde pression
CON8
CON3
CON10AP
CON12
CON6
Relais
Relais
Port série V.24
BRIDGE
LED-V
Cuve eau de mer
Marche
Manuel
2200 µF 40 V
Contacteur 3 ph
Contacteur 3 ph
Moteur CA 380V pour Pompe HP
Moteur CA 380V pour Pompe BP
Dessalator s.a.r.l. Antibes
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Document Number
Rev
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Date:
Monday, December 18, 2006
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of

WATER MAKER - 440 TO 1,000 LITRES / HOUR
4. Instructions for use

1. Ensure the valves are open before starting up the water maker.

2. It can be started only when the sea water float is in a high position, contact on.

3. If the water maker has not been run for several days, rinse it manually with the three-way valve on the pre-pump and start the pre pump. This should be carried out while the water maker is idle and with the pressure regulator open (fully anti-clockwise).Rinse for two minutes. Purge in the same time stainless steel pre-filters.

4. To start the water maker, the pressure regulator must be open.
   Switch on. The low pressure pump will run for two minutes, after which the HP pump will start automatically. Please check the rotating direction of the pre pump when starting (arrow on the bronze pre pump body).
   The control panel has two inverters. The one on the left is for rinsing and engages only the low pressure pump (please do not forget to place the sand pre filter valve on the “rinsing” position before starting it). The other position allows starting the water maker.
   On the other inverter on the right, there is an automatic position for running the automatic floats, provided these floats are connected:
   - one of them to the fresh water settling tank,
   - the other one to the fresh water storage tank.

5. Turn the pressure regulator dial to the right, until the HP gauge reading is in the green zone.

6. Fresh water quality and flow into the tank is automatically monitored by the electronic controller.

7. If pressure becomes too high the water maker will cut out and the red indicator will light up. If this occurs, reduce pressure and restart the water maker.

8. If the water maker is not used for extended periods of time, it should be rinsed preferably once a month while starting the pre pump. If not in use for more than two months, remember to sterilize the membranes (with our special sterilization cartridge) for a storage.

Note : Fresh water production depends on the temperature of the sea water and on the cleanliness of the pre-filters, together with the right voltage of the generating unit.

DESALINATOR 440 TO 1,000 LITRES / HOUR
5. REVERSE OSMOSIS PRINCIPLE

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membranes. This waste, along with remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids), approximately 2% of the 35.000 ppm / TDS will pass through the membranes.
This guarantees drinking water with a TDS value of 500 (average). Please note that the drinking water with produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with a slight dose of chlorine (or iodine) to ensure it remains consumable. Pay attention not to allow pure chlorine (or a too high dose of chlorine) into the desalination system, as this could damage the device.

How does your water maker work?

Sea water enters the inlet valve which penetrates the hull. The sea water is then routed by the pre-pump through the 25µm pre-filters. The filters water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurized water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: if the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity >1.000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel. Capacities of drinking water production are giving for a 25°C temperature of sea water. Performances are reduced of 2.5 to 5% for one °C of lower temperature.

DESALINATOR 440 TO 1,000 LITRES / HOUR
5.1 THE MEMBRANES

MEMBRANES, DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of the reverse osmosis system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the water maker is achieved with sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water and on the sailing area. Output drops by approximately 2.5 to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C.Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C, as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid, either sea water before treatment, fresh water provisionally stored or sterilizing liquid, if the water maker is not used for extended periods of time (Sterilizer is effective for six months and must be replaced after this period of time).

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the water maker in Marinas. The system is not recommended for use in muddy or polluted water (briny water, river, Red sea), which can clog and damage the membranes.

However, if the water maker has to be used in such conditions, only run it for very short periods and as soon as clean sea water becomes available clean the membranes and run the system without pressure for 5 minutes with the pressure regulator open.

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DESALINATOR 440 TO 1,000 L/ HOUR
6.1 MAINTENANCE : Cleaning the membranes

**CAUTION: IN FREEZING CONDITIONS,
EMPTY THE GAPMETER ON THE CONTROL PANELS,
DISCONNECTING THE PRODUCTION PIPE AND BLOWING OR
INJECTING AIR IN THE PIPE.**

CLEANING THE MEMBRANES:

When should the membranes be cleaned? On average after 800 hours working.

Under normal conditions, the membranes may be contaminated by mineral residues or biological matter. These residues reduce both the volume of drinking water produced and the amount of salt filtered out. The membranes should be cleaned whenever the volume of water produced is 10 to 15% lower than initial volume. This volume comparison can be made over the first 24 or 48 hours of operation, or when the detector indicates low quality after the probe has been cleaned. If the drinking water produced falls below the normal working specifications : sea water containing a TDS of 35,000 ppm, sea water temperature of 25°C and pressure of 65 bars in green zone, and if production is not improved by rinsing the membranes, then the membranes have to be replaced.
Please take in consideration that the volume of drinking water produced is dependent on ideal sea water temperature and pressure in system. Therefore if the volume of drinking water produced falls, it does not mean necessarily that the membranes need to be replaced.

Membranes cleaning procedure:

1. Open the regulator valve fully (turning anti-clockwise).
2. Close the inlet and outlet hull valves.
3. Disconnect the inlet and outlet hoses, and place them in a bucket containing 10 litres of fresh water and the cleaning solution.
4. Run the water maker without pressure for 10 minutes and then switch off.
5. Repeat three times then rinse with fresh water for at least 15 minutes.
6. Reconnect the hoses.

STERILIZING THE MEMBRANES

When should the membranes be sterilized?

Normally, regular monthly rinsing of the membranes may be all that is required to maintain the membranes. If this is not possible, sterilization will be necessary. Sterilizing efficiency doesn't exceed 6 months. Membranes don't be sterilized more than twice a year. Between these two operations membranes must be rinsed with fresh water.

Abusive concentration of sterilizing can corrode membranes head. Non-observance of these recommendations and the using of other sterilizers cancel all guarantees.

Membranes sterilizing procedure:

1. Rinse the water maker with fresh water while placing the three-way valve of the pre-pump on the side of fresh water then unscrewing to the maximum the regulator (5 minutes).

2. Place sterilizing doses in the pre-filter cartridge, then close again the pre-filter and rinse 2 minutes.

6.3. High Pressure Pump

The HP pump is half filled of oil up to the level indicated on the gauge. Normally, the lubrication is made for 500 hours. In case of replacement, use a multi-grade oil 20W40 and do not exceed the level located on the oil dipstick.

Caution: The scotch tape placed on the red stopper of oil filling of the HP pump is just here for the transport: it must be removed before the use.

6.4. Mineralizing

If a mineralizing cartridge is provided, this one have to be placed on the circuit of water to the tanks.

To obtain one dose, use three packets.

DESALINATOR 440 TO 1,000 LITRES /HOUR
7. Filters and power supply

7.1 Basket pre filter

Sea water position: Normal functioning

Fresh water position: Rinsing

Waste oulet

Fresh water position

Sea water

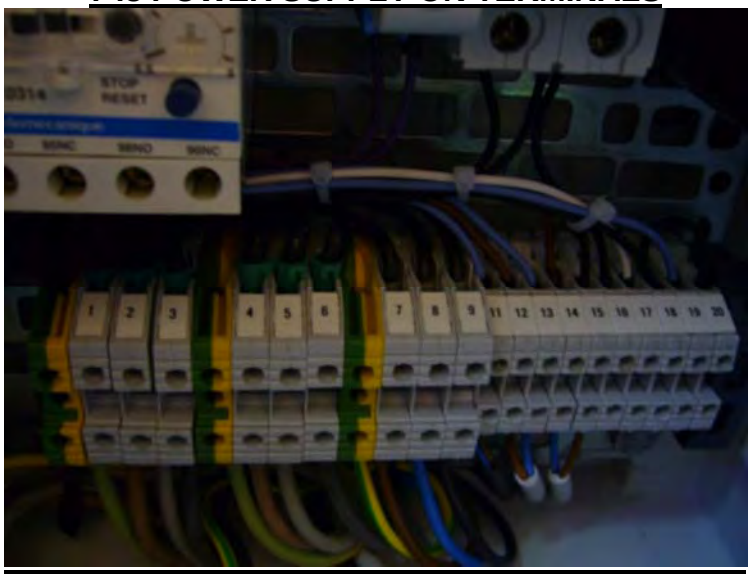
7.2 Pre filter unit

The red valves allow purging the filters.

25 µm cartridge filter

5 µm cartridge filter

7 .3 POWER SUPPLY ON TERMINALS



1,2,3: 400V power supply; 4,5,6: High pressure motor connection; 7,8,9 : Low pressure pump connection; 11, 12: pressure switch; 13,14: Quality probe; 15,16: Fresh water solenoid valve; 17,18: sea water float; 19,20: Fresh water float.
Connection of the sea water float: blue and black cable (closed buckle for starting)
Connection of the fresh water float: brown and black cable (opened buckle for starting)

DESALINATOR 440 TO 1,000 LITRES /HOURS
7. TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTIONS
No reading on the low pressure gauge	Valve closed Pre-pump impeller stuck Dirty pre-filters	Check valves Turn the pump fan with a screwdriver or clean the pump body. Change the filters.
Noisy HP pump	Reduce water inlet or air inlet in the system Residues in the pump valves.	Insure correct size of pipes (diameter), clips and filters secure filters clean. Open the pump head and clean the 6 valves.
Variations in speed of the electric motors.	Generating unit too weak Voltage error Wrong frequency Dirty fuel filter.	Service the generating unit and address adjustments and maintenance.
L-shaped valve	No rinsing No sea water Handle incorrectly mounted.	Fix the handle correctly.

USER'S MANUAL
INSTALLATION OF A DESSALATOR 440 TO 1,000 LITRES / HOUR IN 400 V

BEWARE: DO NOT LIFT BY CHASSIS!

DESSALATOR

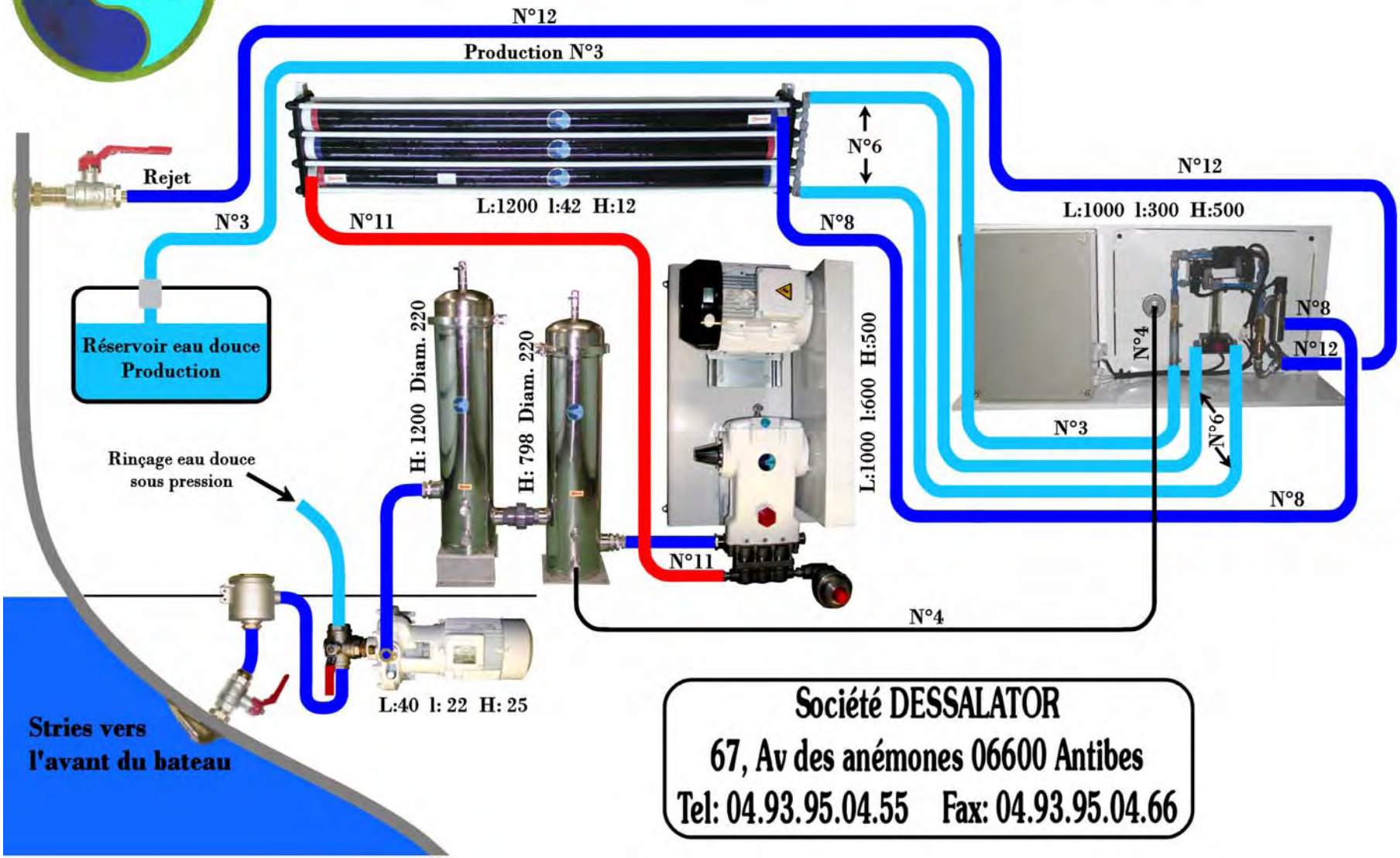
Technical and sales departments:
Z.I des 3 Moulins – « Euro 92 » – Bât. D – rue des Cistes – 06600 ANTIBES

Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
Email: contact@dessalator.com
Web Site: www.dessalator.com

DESALINATOR 440 TO 1,000 LITRES / HOUR

CONTENTS

SCHEMA D'IMPLANTATION DESSALATOR 380V



Société DESSALATOR

67, Av des anémones 06600 Antibes

Tel: 04.93.95.04.55 Fax: 04.93.95.04.66

2. COMPONENTS SUPPLIED BY DESSALATOR ACCORDING TO THE CHOOSEN MODEL:

Pre pump:

It enables water to flow through the pre filters to the HP motor unit.

Pre-filters:

Stainless steel pre filter - multi cartridges 25 µm 10 Inch (x5): it allows a first filtration. It is supplied with an anode in its cover.

Stainless steel pre filter - multi cartridges 5 µm 10 inch (x5): it allows a filtration up to 5µm; It is supplied with an anode in its cover.

Motor unit:

HP motor, fixed on a frame with silent blocks.

Control panel

HP motor unit

Control panel:

The control panel manages the functions of the water maker.

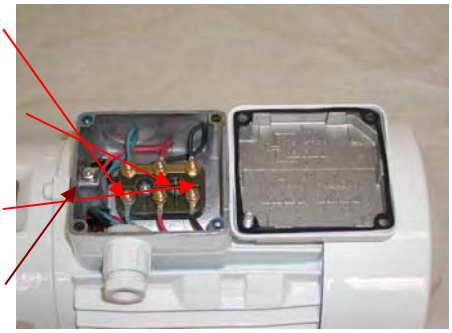
WATER MAKER - 440 TO 1,000 LITRES / HOUR
3.1 Installation instructions

Pre pump:

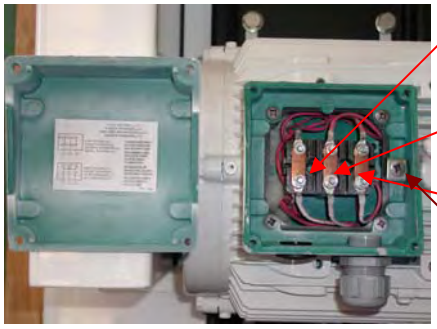
The pre pump with its rinsing valve[3] and its pre filter should be installed in charge and the pressurized fresh water should be connected to the valve.
Beware: Please check the rotating direction of the pre pump when starting up the machine.

THE PRE PUMP SHOULD NOT BE PLACED WHERE THERE IS A RISK OF WATER SPRAY.

Pre pump cable case 400V
LP Pump
(three-phased motor 240 / 400)
Beware: Check the direction of rotation



Pump cable case 400V
HP pump
(Motor 400 / 660V)

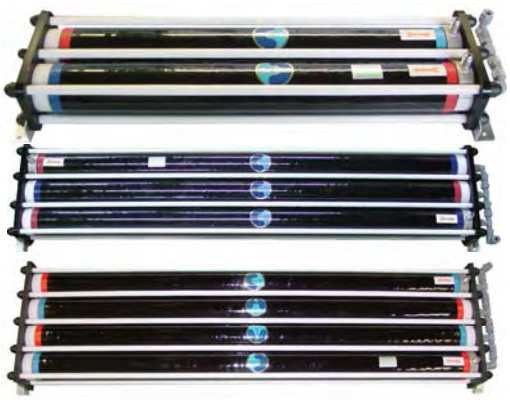


CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

PLEASE DO NOT FORGET TO CONNECT THE CHASSIS TO EARTH ON THE SCREW LOCATED ON THE FRONT PANEL!

WATER MAKER - 440 TO 1,000 LITRES / HOUR
3.2 Installation instructions

Membrane(s), according to desired water flow:



2 membranes for 440 litres / hour water production.

3 membranes for 660 litres / hour water production.

4 membranes for 1000 litres / hour water production.

The number of membranes used depends on the desired water flow. Le nombre de membranes est fonction du débit souhaité. Hose from the HP pump should join the membranes at the red ring[1].

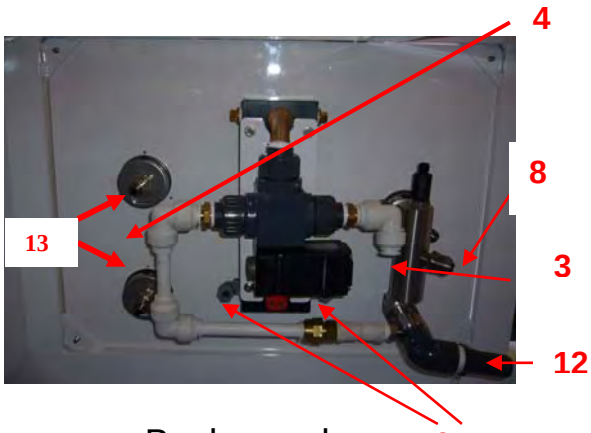
Recommendation: To facilitate the attachment to the HP stainless steel joins[2], it is possible to rotate the heads through 90°, by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Then remove the rod to obtain access, and rotate the membrane end cap using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the unit.

WATER MAKER - 440 TO 1,000 LITRES / HOUR
3.3 Installation instructions

Panel pictures:

Beware: The handle is in the electric connection box (Security for shipment)

Front panel



Back panel

Figures for each connection are as follows:

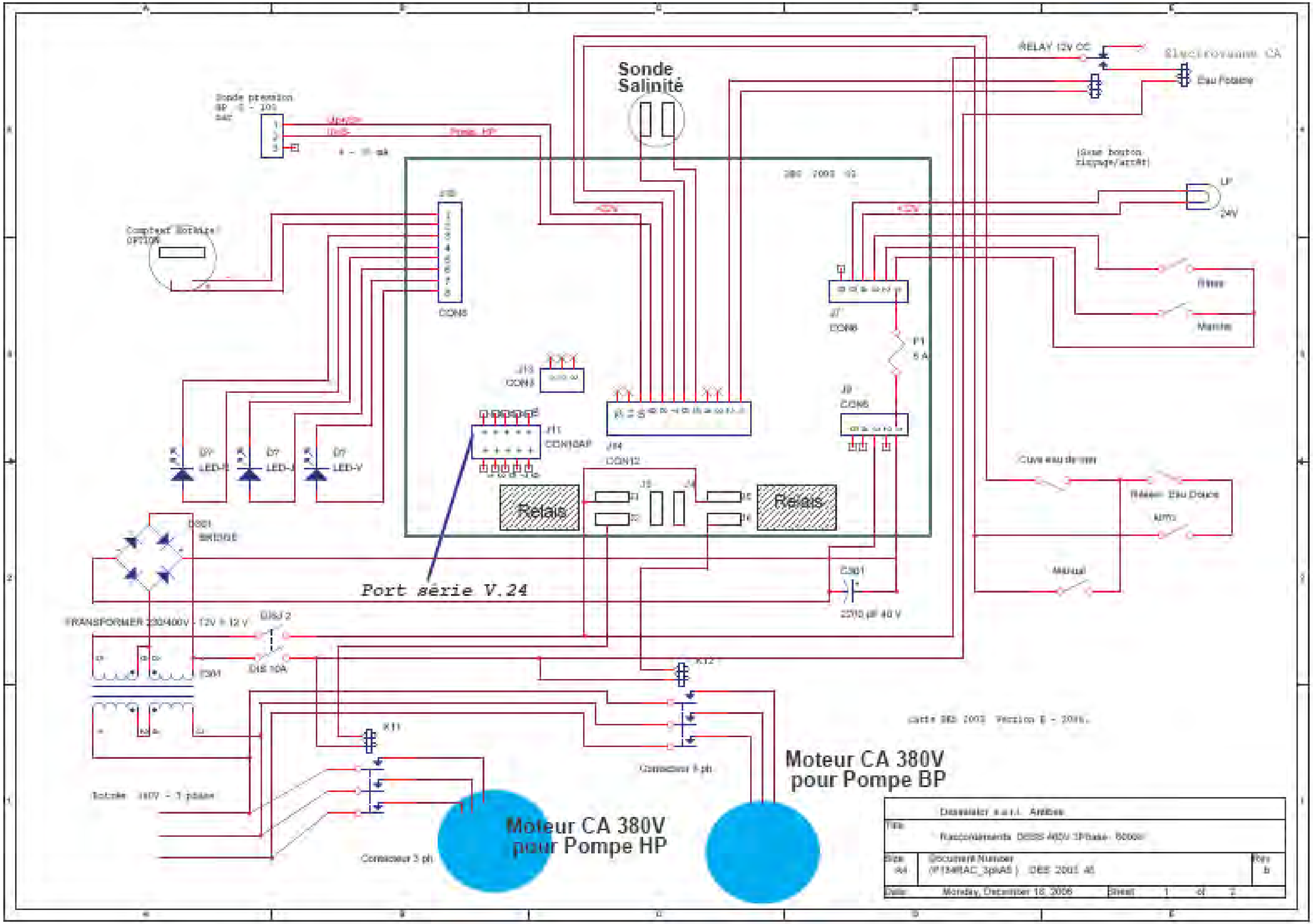
- N°8 (blue): HP piping exiting the membranes.
- N°6 (blue hose 8/10mm diameter): Production hose exiting the membranes.
- N°3: Production hose from panel to tanks. A 15mm inner diameter Tricoflex length will be required which should be connected either to the fresh water tanks or before the fresh water pump, provided there is no constricting valve.
- N°12: Waste outlet: 15 mm inner diameter Tricoflex.
- N°4: 4mm capillary hose to be connected to the exiting side of the HP stainless steel 5 µm pre filter HP; it indicates on the low pressure gauge the dirtiness of the stainless steel pre filter (6m are provided).
- N°13 : 4mm capillary hose to be connected to the entry side of the stainless steel pre filter; it indicates the dirtiness of the sand pre filter.

  In the case of installing a mineralizing filter, it should be located on the production hose to the tanks.

HP motor unit:

There are two water connections to the pump head:

- A ¾ diameter pipe[1] from the pre filters.
- A 19 mm diameter HP hose[2] to the membranes.
- Two capillary hoses are connected to the stainless steel pre filter; To disconnect them, please push the black collar and pull the hose at the same time. The HP unit should always be installed horizontally. Do not place it where there is a risk of water spray. The connection should be done as on the scheme below.


Sonde Salinité
RELAY 12V CC
Eau Potable
LP
24V
CON8
J7
CON6
P1
J9
CON6
J13
CON3
J11
CON10AP
J14
CON12
Relais
Relais
LED-R
LED-J
LED-V
BRIDGE
Port série V.24
TRANSFORMER 230/400V - 12V + 12 V
C301
2200 µF 40 V
Cuve eau de mer
Marche
Manuel
K11
K12
Connecteur 3 ph
Connecteur 3 ph
Moteur CA 380V pour Pompe HP
Moteur CA 380V pour Pompe BP
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WATER MAKER - 440 TO 1,000 LITRES / HOUR
4. Instructions for use

1. Ensure the valves are open before starting up the water maker.

2. If the water maker has not been run for several days, rinse it manually with the three-way valve on the pre-pump and start the pre pump. This should be carried out while the water maker is idle and with the pressure regulator open (fully anti-clockwise).Rinse for two minutes. Purge in the same time stainless steel pre-filters.

3. To start the water maker, the pressure regulator must be open.
   Switch on. The low pressure pump will run for one minute, after which the HP pump will start automatically. Please check the rotating direction of the pre pump when starting (arrow on the bronze pre pump body).
   The control panel has two inverters. The one on the left is for rinsing and engages only the low pressure pump (please do not forget to place the pre filter valve on the “rinsing” position before starting it). The other position allows starting the water maker.
   The manual position allows a continuous working.

4. Turn the pressure regulator dial to the right, until the HP gauge reading is in the green zone.

5. Fresh water quality and flow into the tank is automatically monitored by the electronic controller.

6. If pressure becomes too high the water maker will cut out and the red indicator will light up. If this occurs, reduce pressure and restart the water maker.

7. If the water maker is not used for extended periods of time, it should be rinsed preferably once a month while starting the pre pump. If not in use for more than two months, remember to sterilize the membranes (with our special sterilization cartridge) for a storage.

Note : Fresh water production depends on the temperature of the sea water and on the cleanliness of the pre-filters, together with the right voltage of the generating unit.

DESALINATOR 440 TO 1,000 LITRES / HOUR
5. REVERSE OSMOSIS PRINCIPLE

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membranes. This waste, along with remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids), approximately 2% of the 35.000 ppm / TDS will pass through the membranes.
This guarantees drinking water with a TDS value of 500 (average). Please note that the drinking water with produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with a slight dose of chlorine (or iodine) to ensure it remains consumable. Pay attention not to allow pure chlorine (or a too high dose of chlorine) into the desalination system, as this could damage the device.

How does your water maker work?

Sea water enters the inlet valve which penetrates the hull. The sea water is then routed by the pre-pump through the 25µm pre-filters. The filters water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurized water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: if the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity >1.000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel. Capacities of drinking water production are giving for a 25°C temperature of sea water. Performances are reduced of 2.5 to 5% for one °C of lower temperature.

DESALINATOR 440 TO 1,000 LITRES / HOUR
5.1 THE MEMBRANES

MEMBRANES, DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of the reverse osmosis system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the water maker is achieved with sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water and on the sailing area. Output drops by approximately 2.5 to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C.Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C, as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid, either sea water before treatment, fresh water provisionally stored or sterilizing liquid, if the water maker is not used for extended periods of time (Sterilizer is effective for six months and must be replaced after this period of time).

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the water maker in Marinas. The system is not recommended for use in muddy or polluted water (briny water, river, Red sea), which can clog and damage the membranes.

However, if the water maker has to be used in such conditions, only run it for very short periods and as soon as clean sea water becomes available clean the membranes and run the system without pressure for 5 minutes with the pressure regulator open.

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DESALINATOR 440 TO 1,000 L/ HOUR
6.1 MAINTENANCE : Cleaning the membranes

**CAUTION: IN FREEZING CONDITIONS,
EMPTY THE GAPMETER ON THE CONTROL PANELS,
DISCONNECTING THE PRODUCTION PIPE AND BLOWING OR
INJECTING AIR IN THE PIPE.**

CLEANING THE MEMBRANES:

When should the membranes be cleaned? On average after 800 hours working.

Under normal conditions, the membranes may be contaminated by mineral residues or biological matter. These residues reduce both the volume of drinking water produced and the amount of salt filtered out. The membranes should be cleaned whenever the volume of water produced is 10 to 15% lower than initial volume. This volume comparison can be made over the first 24 or 48 hours of operation, or when the detector indicates low quality after the probe has been cleaned. If the drinking water produced falls below the normal working specifications : sea water containing a TDS of 35,000 ppm, sea water temperature of 25°C and pressure of 65 bars in green zone, and if production is not improved by rinsing the membranes, then the membranes have to be replaced.
Please take in consideration that the volume of drinking water produced is dependent on ideal sea water temperature and pressure in system. Therefore if the volume of drinking water produced falls, it does not mean necessarily that the membranes need to be replaced.

Membranes cleaning procedure:

1. Open the regulator valve fully (turning anti-clockwise).
2. Close the inlet and outlet hull valves.
3. Disconnect the inlet and outlet hoses, and place them in a bucket containing 10 litres of fresh water and the cleaning solution.
4. Run the water maker without pressure for 10 minutes and then switch off.
5. Repeat three times then rinse with fresh water for at least 15 minutes.
6. Reconnect the hoses.

STERILIZING THE MEMBRANES

When should the membranes be sterilized?

Normally, regular monthly rinsing of the membranes may be all that is required to maintain the membranes. If this is not possible, sterilization will be necessary. Sterilizing efficiency doesn't exceed 6 months. Membranes don't be sterilized more than twice a year. Between these two operations membranes must be rinsed with fresh water.

Abusive concentration of sterilizing can corrode membranes head. Non-observance of these recommendations and the using of other sterilizers cancel all guarantees.

Membranes sterilizing procedure:

1. Rinse the water maker with fresh water while placing the three-way valve of the pre-pump on the side of fresh water then unscrewing to the maximum the regulator (5 minutes).

2. Place sterilizing doses in the pre-filter cartridge, then close again the pre-filter and rinse 2 minutes.

6.3. High Pressure Pump

The HP pump is half filled of oil up to the level indicated on the gauge. Normally, the lubrication is made for 500 hours. In case of replacement, use a multi-grade oil 20W40 and do not exceed the level located on the oil dipstick.

Caution: The scotch tape placed on the red stopper of oil filling of the HP pump is just here for the transport: it must be removed before the use.

6.4. Mineralizing

If a mineralizing cartridge is provided, this one have to be placed on the circuit of water to the tanks.

To obtain one dose, use three packets.

DESALINATOR 440 TO 1,000 LITRES /HOUR
7. Filters and power supply

7.1 Basket pre filter

Sea water position: Normal functioning

Fresh water position: Rinsing

Waste oulet

Fresh water position

Sea water

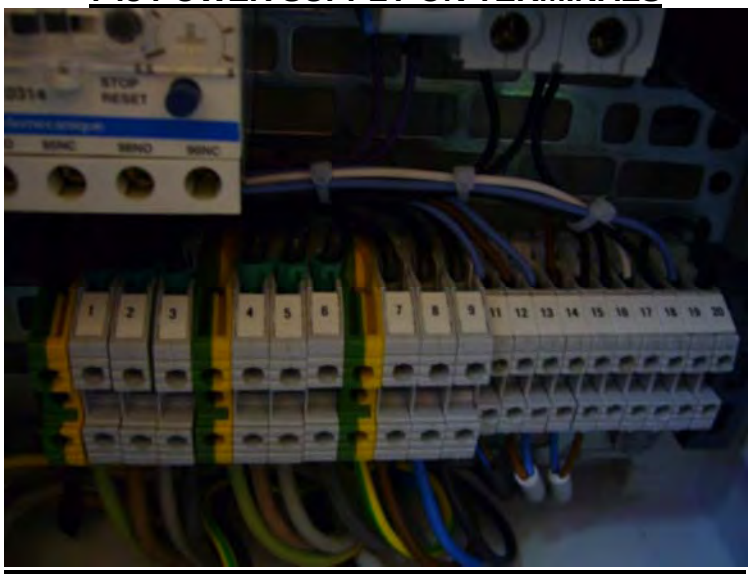
7.2 Pre filter unit

The red valves allow purging the filters.

25 µm cartridge filter

5 µm cartridge filter

7 .3 POWER SUPPLY ON TERMINALS

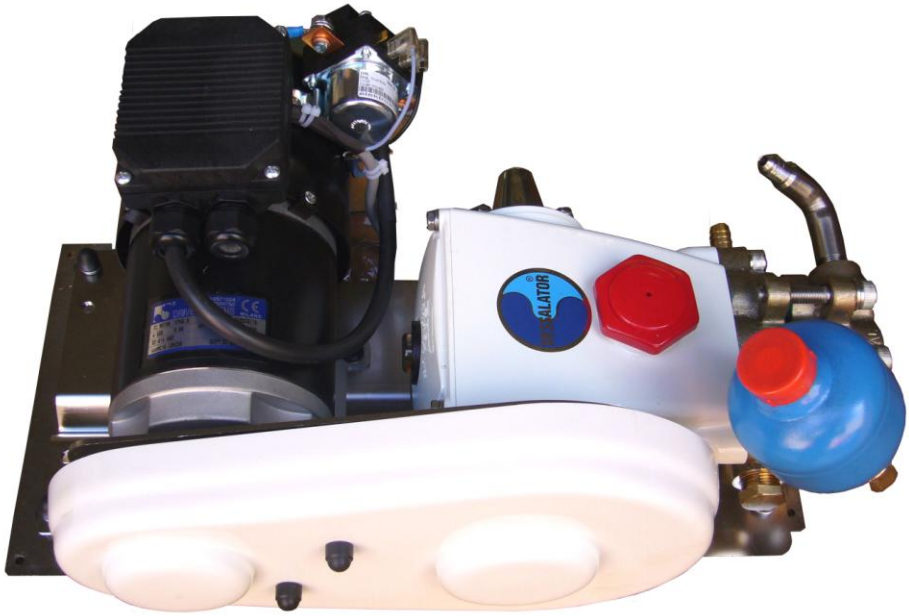


1,2,3: 400V power supply; 4,5,6: High pressure motor connection; 7,8,9 : Low pressure pump connection; 11, 12: pressure switch; 13,14: Quality probe; 15,16: Fresh water solenoid valve;

DESALINATOR 440 TO 1,000 LITRES /HOURS
7. TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTIONS
No reading on the low pressure gauge	Valve closed Pre-pump impeller stuck Dirty pre-filters	Check valves Turn the pump fan with a screwdriver or clean the pump body. Change the filters.
Noisy HP pump	Reduce water inlet or air inlet in the system. Residues in the pump valves.	Insure correct size of pipes (diameter), clips and filters secure filters clean. Open the pump head and clean the 6 valves.
Variations in speed of the electric motors.	Generating unit too weak. Voltage error Wrong frequency Dirty fuel filter.	Service the generating unit and address adjustments and maintenance.
L-shaped valve	No rinsing No sea water Handle incorrectly mounted.	Fix the handle correctly.

USER'S MANUAL
DESSALATOR® 60 LITRES / HOUR



DESSALATOR

Technical and Sales Departments:
Z.I des 3 Moulins – "Euro 92 – Bât. D – 282 rue des Cistes – 06600 ANTIBES

Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
e-mail: contact@dessalator.com
Web site: www.dessalator.com

Version A3

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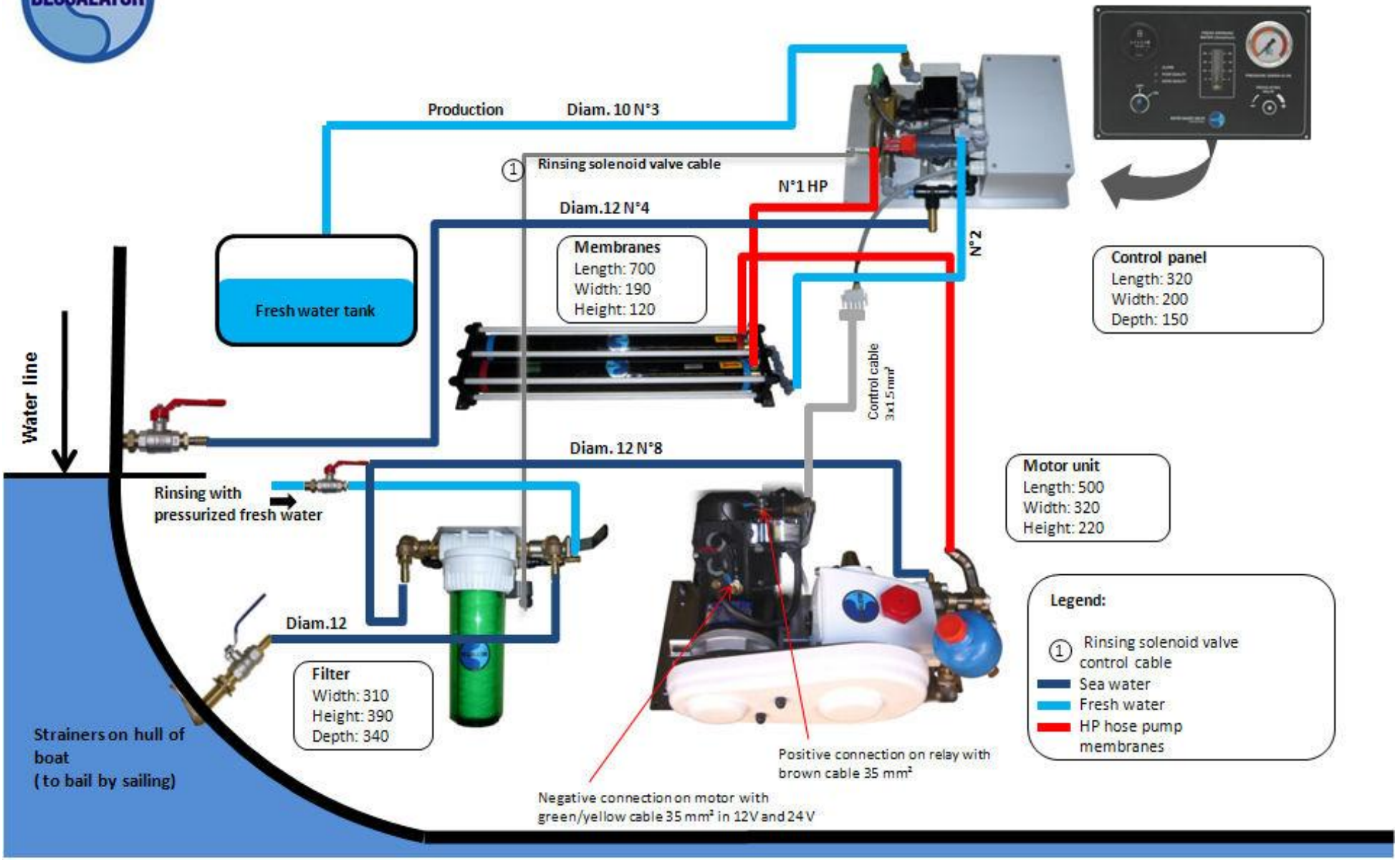
Appendix:

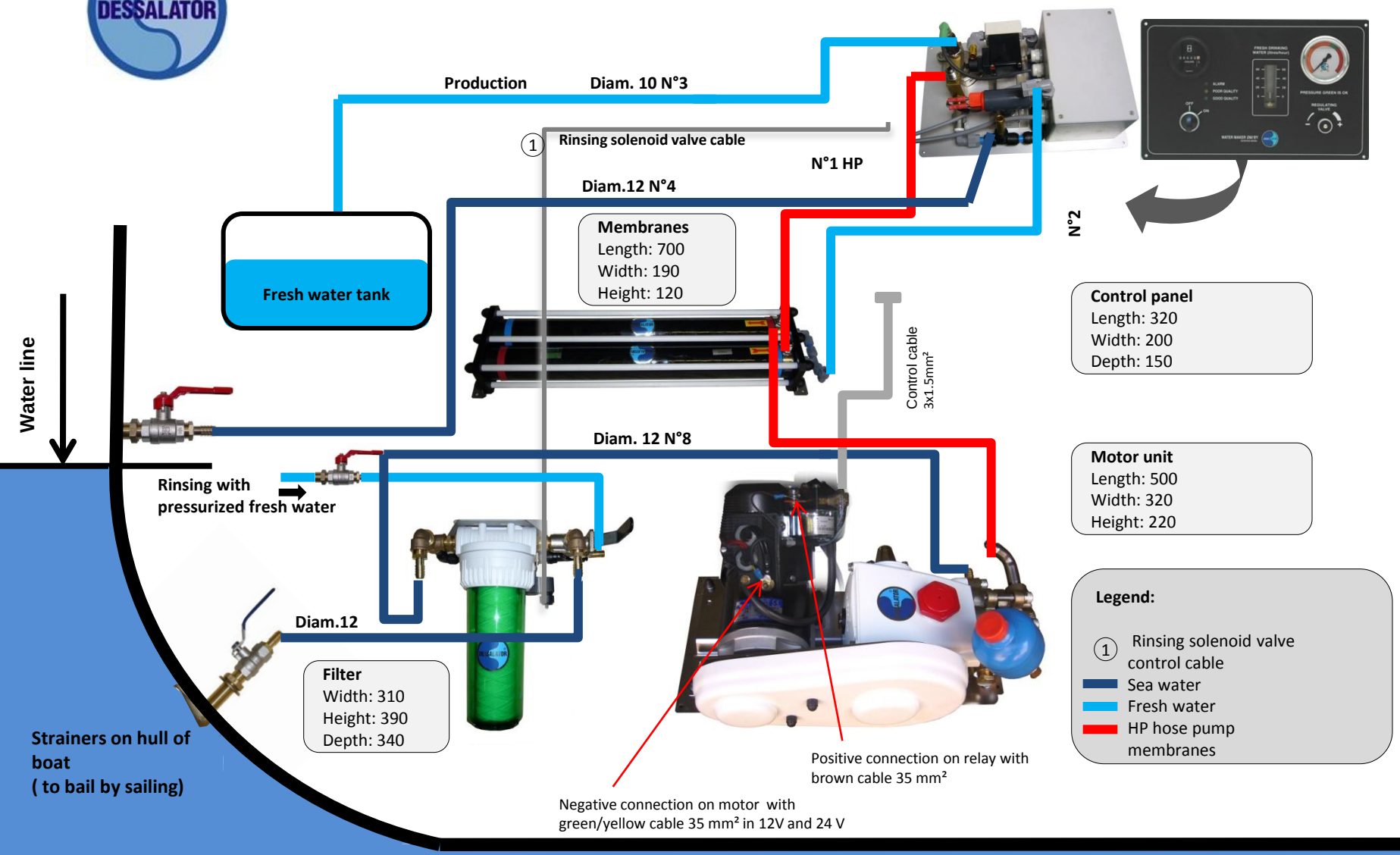
Connections plan: Connections DES 12/23/230V DUO- Doc : RAC_DUO – 4/12/10

INSTALLATION DIAGRAM DESSALATOR D60 12 TO 24V



Société DESSALATOR, Z.I. des 3 Moulins « Euro 92 » Bât. D, 06600 Antibes .
Tél: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 e-mail: contact@dessalator.com

Installation Diagram Dessalator D60 12 V and 24V



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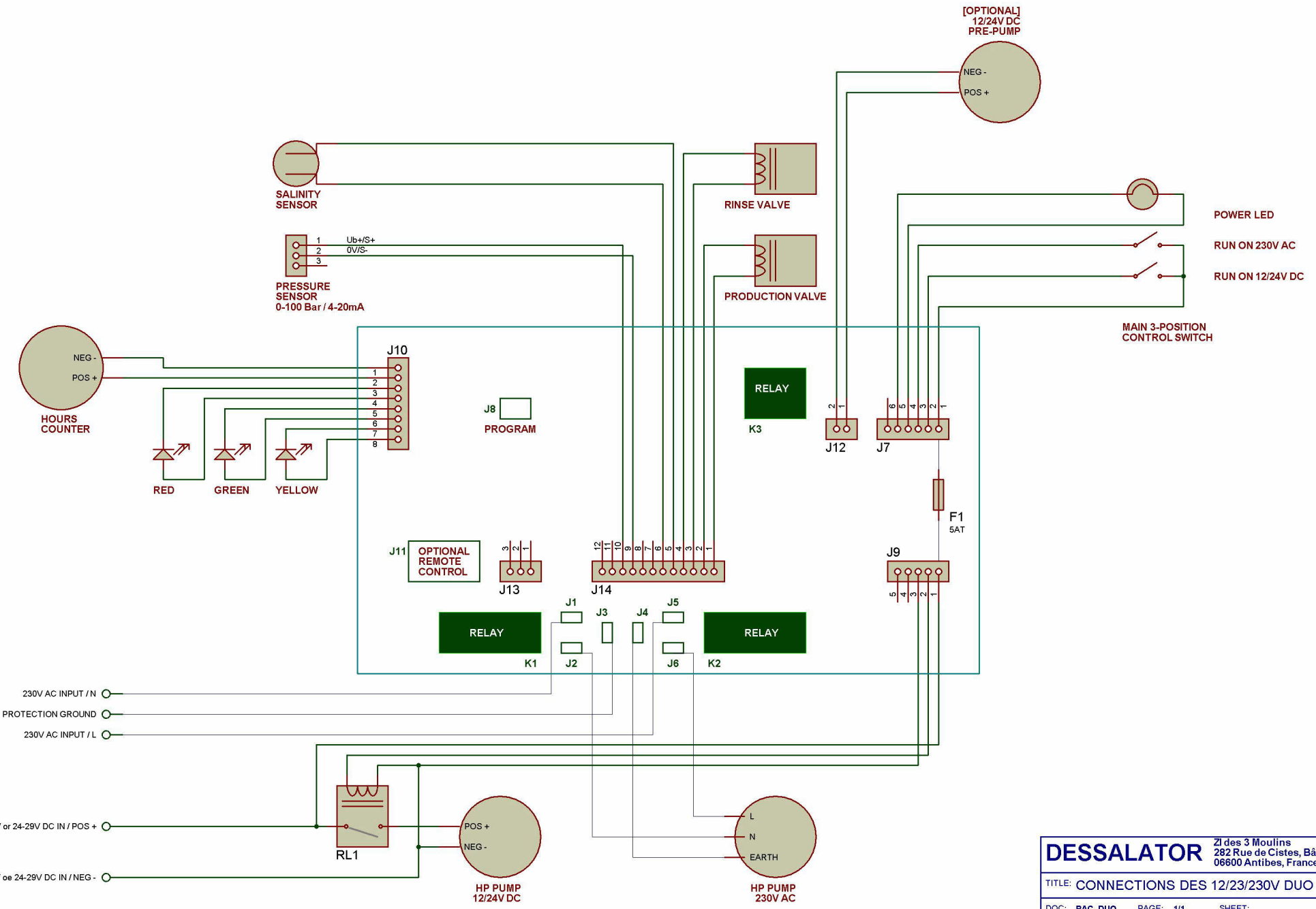


DESSALATOR

ZI des 3 Moulins
282 Rue de Cistes, Bâtiment Euro 92
06600 Antibes, France

TITLE: CONNECTIONS DES 12/23/230V DUO

DOC:	RAC_DUO	PAGE:	1/1	SHEET:	
REV:	A	DATE:	04/12/10	AUTHOR:	VAK

GREENTRONICS BV - THE NETHERLANDS

1. Components supplied with the Dessalator®:

Version A3

Hull valve:
It must be located the lowest possible in the boat, to the back for a motor yacht or in the centre near the keel for a sailing boat.
The hull valve strainer filters out the larger particles at system entrance.

Pre-filter:
It must be located the nearest possible to the hull valve and be compulsory under the waterline. If not possible, there is a solution: install a LP pump (optional).
The pre-filter filters out solid particles down to 5 µm at the motor unit inlet. It is supplied with wrench.
For automatic rinsing an electro-valve is mounted.

Motor-Pump unit:
It must be located compulsory under the waterline
The motor-pump unit is comprised of the 12 or 24 V motor and a high pressure pump.

Membrane unit:
The membrane unit includes 2 membranes 2521 assembled in a compact frame.

According to the model, a fuse or a circuit breaker is supplied.

Control panel:
includes a HP gauge, a flowmeter, an on/off switch, a pressure adjustment knob, an operating time meter, 3 indicator lights.

Pipes and hoses supplied by Dessalator®:

- High pressure pipes pump/membranes and membranes/control panel (2 pipes and 4 special connectors)
- Water production pipe membrane / control panel.

Additional hardware needed for assembly:

- Miscellaneous screws (including Parker)
- Stainless jubilee clips ∅ 10 and ∅12
- Assortment of plastic rings (tie wraps)
- Teflon tape or insulating water proof tape
- Silicon Rubson mastic, Sicaflex or equivalent
- Ribbed insulating pipe for cables and HP tubes
- Tricoflex hoses ∅ 10 and ∅ 12
- Power cable: 35mm² for the 12V and 20mm² for the 24V
- Various tools (electric drill, saw, …)

2. How to install the watermaker:

2.1 Sea water inlet

Sea water inlet valve:

The strainer should be positioned as low as possible below the waterline and as far as possible from the deck waste oulet. Drill the hull ∅ 21mm. The grooves on the strainer should be facing forward (towards the bow) for maximum water intake when the boat is moving forward. Please seal watertight with Rubson mastic or Sicaflex.
The hull valve should be accessible for maintenance. Make the valve / strainer and valve / hose connector watertight using 577 Loctite or Teflon tape.
Recommendation: ensure that the immersed part is painted with underwater grade paint.

Cartridge pre-filter:

The pre-filter should also be positioned as low as possible below the waterline and it should remain accessible. The mounting bracket is reversible, which facilitates the height positioning. The hose connection must be done with 12mm inner diameter Tricoflex for all the sea water circuit and the pressurized rinsing. Don't forget to place two stainless steel collars on each connection. 5cm space should be left below the filter body to allow the filter basin to be removed. A wrench is supplied to dismantle the filter. The fresh water pressurized rinsing must be connected to the output of your board pump. An electro-valve is mounted on the output (diam. 12) for automatic rinsing. It can be connected under a sink, a wash basin or on the way of pressurized cold water hoses. The valve handle must be positioned to the front when the water maker is working. For a manual rinsing, please move the valve handle to the back. When replacing the filter cartridge, please check that the O-ring seal for the basin is secure and that the bleeder screw is tightened and fill the circuit with fresh water again for 3 to 4 minutes without pressure, put then the handle to the front.

Connections:

Hull valve / three-way valve, Pre-filter / pump, Fresh water / three-way valve, rinsing electro-valve
The sea water inlet valve should be connected to the pre-filter using a tricoflex hose of inner ∅ 12mm, for sea water circuit and rinsing under pressure. Mount two jubilee clips at each joint, with their tightening heads positioned diametrically opposite on the hose. Connect the pressurized fresh water from the water oulet to the three-way valve. This connection can be made under a sink, wash basin or anywhere on the length of the pressurized fresh water pipe. When operating in sea water mode, the valve handle should be positioned in line with the filter (see photo above).

Recommendation:

If the pipe must pass through dividing walls or touch sharp edges, use an insulating pipe or tube superior to the pipe diameter to protect it against wear and friction.

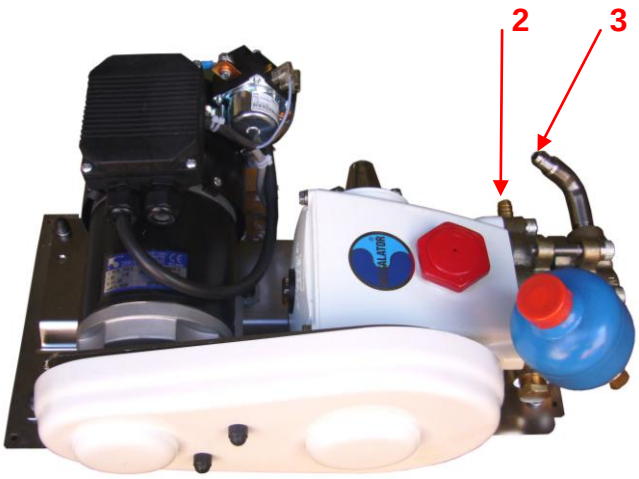
2. How to install the desalinator:

2.2 Motor unit:

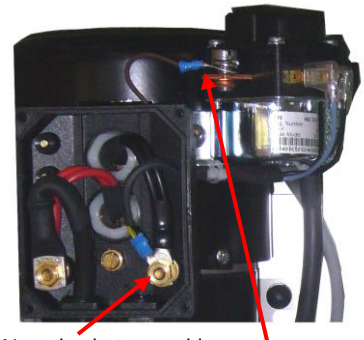
The HP motor unit should be installed as low as possible in the boat in a horizontal position and it must be protected from water spray as much as possible. The unit is mounted using two brackets under the two motors leaving a few centimetres clear space around the unit, to get sufficient air circulation space for motor cooling. The connection between the prefilter[1] oulet and the inlet to the low pressure side of the pump[2] is in Tricoflex hose of ∅ 12mm with doubled stainless jubilee clips at each joint.

The HP head[3] of the pump is connected to the membrane inlet (red mark) through an HP pipe, cut to the appropriate length (see installation of connectors appendix A2).

Apply a little liquid Loctite or nut seal on the male and female cones before joining.



2.3 Electrical connections:

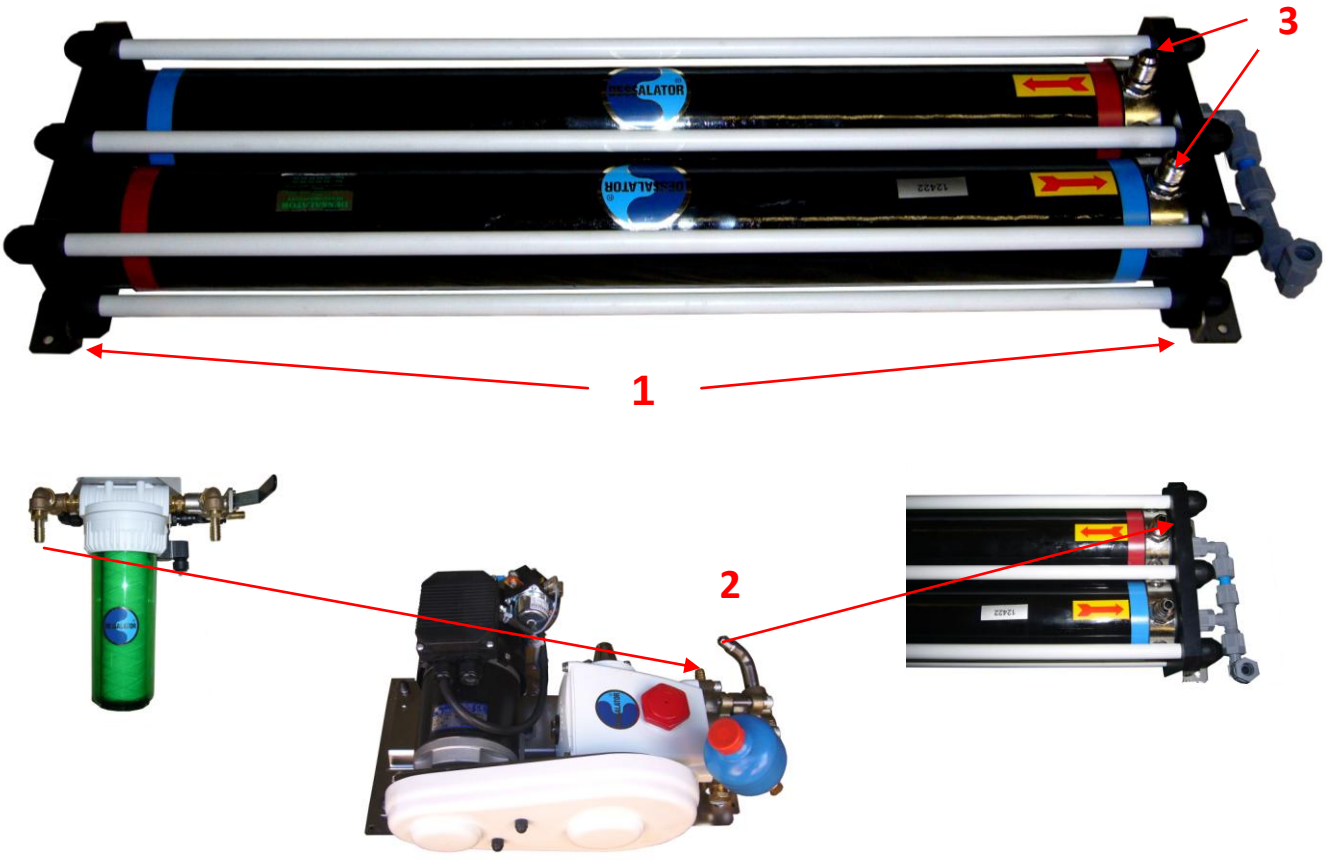


CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

When connecting the 12 or 24V motor ensure that the polarity is correct: positive (brown wire) on the relay and negative (green/yellow wire) on the 12 or 24V motor. Depending on the voltage install a 12V fuse holder (supplied) or a 24V circuit breaker (supplied) on the positive cable. Ensure that the cable is of sufficient diameter: 35mm² for the 12V or 20mm² for the 24V. The Dessalator control cable is 5m long and is equipped with a plug with a pin locator system. The Dessalator® can only be operated when the power cable is connected to a DC supply.

2. How to install the desalinator:

2.4 Membrane unit

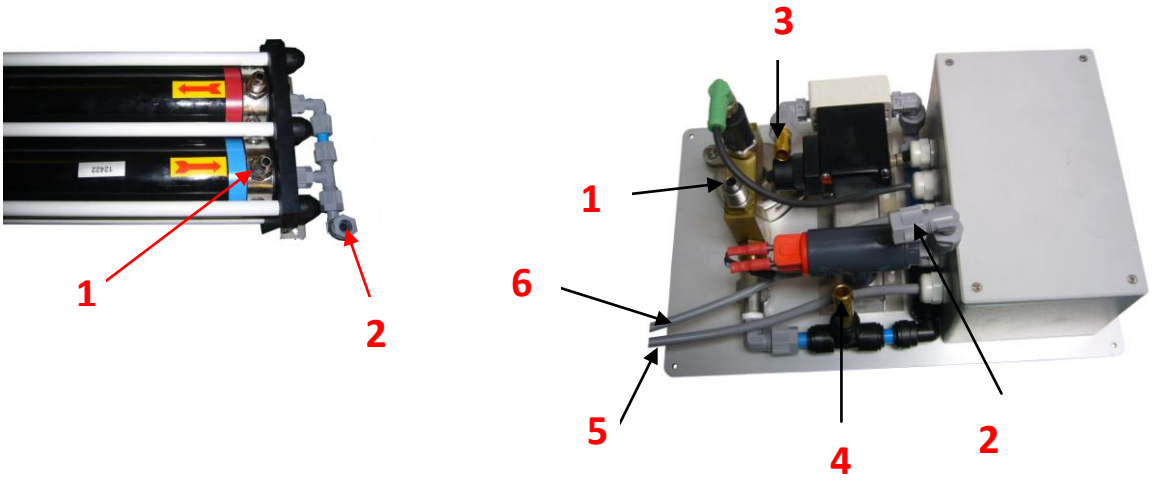


The membranes can be installed horizontally, preferably flat or on a wall support. They are mounted using 8 Parker screws in *stainless steel brackets*[1]. As the hose from the HP pump[2] vibrates, it is preferable to install the hose with an insulating tube. The HP connectors should be installed strictly in accordance with the instructions (Appendix A2). Apply a little loctite or nut seal to the two male and female cones before tightening.

Recommendation: To facilitate the connection of the HP stainless steel fittings[3], it is possible to rotate the heads through 90° by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Remove the rod to obtain access and rotate the membrane head using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the assembly.

2. How to install the desalinator:

2.5 Control panel:



The control panel must be mounted on a vertical surface as close as possible to the motor / pump unit and to the membranes. Leave space behind the panel to facilitate the connections. It is recommended that it is installed at the bottom or on the sides of cupboards, under chart table or main cabin seats, on the front panel of a rear bunk, …

The panel has the following water connections:

- HP hose[1]
- Production hose exiting the membranes (blue hose)[2]
- Production hose from panel to tanks[3]: a 10mm inner ∅ Tricoflex hose will be required which must be connected either to the fresh water tanks or to the distribution manifold on the fresh water unit inlet provided there is no constricting valve on the fresh water tank outlet.
- A Tricoflex waste oulet inner ∅ 12mm hose[4] will also be required which can be connected to a sink, wash basin or cockpit water drain, to avoid having the hull redrilled. In this case, remember to open the outlet valves before using the Dessalator.

Electrical connection:

- The 12 or 24V motor power cable[5] with a connector[5] and pin location system is connected to the cable exiting the 12 or 24V motor.
- The solenoid valve is connected with cable[6].

3. Starting the Dessalator®:

1. Ensure the valves are open before starting up the desalinator (Hull valve and waste oulet valve if relevant)

2. **To be done compulsory:**
   For the first use, after the replacement of the filter, when lifting the boat out of the water or for a long period of not using your water maker, please fill the circuit with fresh water WITHOUT PRESSURE with the pump of board: put the handle valve on the pre filter to the back; this operation should be done for 3 or 4 minutes, water maker stopped and pressure captor open (fully anti-clockwise). Once the circuit is full of fresh water put the valve handle of the pre filter to the front.

3. It is important to take account of the ampere capacity of the batteries and of the working duration: for a use without any risk, it is better to start the motor of the boat.

4. To start the desalinator, the pressure regulator must be open. Switch on.

5. Turn the pressure regulator dial to the right until the HP gauge reading is in the orange zone then gradually adjust until the needle reaches the beginning of the green zone. Check that the pressure remains constant. The purpose of this operation is to remove air from the system and to obtain a more constant pressure while the desalinator is running.

6. Fresh water quality and flow into the tank is automatically monitored by the electronics board.

7. If pressure becomes too high the desalinator will cut out and the red indicator will light up. If this occurs, reduce pressure, switch off and restart the desalinator.

8. To shut down the watermaker: switch off then reduce pressure.

9. To shut down with rinsing, please see page 8 and 9.

10. If the desalinator is not used for extended periods of time it should be rinsed preferably once a month without pressure. If not, the membranes will have to be sterilized for the storage (for 6 months).

Note: Fresh water production depends on the temperature of the sea water and on the cleanness of the 5µm pre-filter.

4. Directions for use:

MEMBRANES DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of your system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the desalinator is achieved with a sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water and the sailing area. Output drops by approximately 2.5% to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C. Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid either sea water before treatment, fresh water provisionally stored or sterilizing liquid if the desalinator is not used for extended periods of time (See sterilization methods appendix A3). Sterilizer is effective for six months and must be replaced after this period of time.

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the desalinator in Marinas. **The system is not recommended for use in muddy or polluted water (briny water, river, Red Sea), which can clog the pre-filter and damage the membranes.** However, if the desalinator has to be used in such conditions only run it for very short periods, as soon as clean sea water becomes available rinse the membrane and run the system without pressure for 30 minutes with the pressure regulator open.

5. Maintenance:

CAUTION: IN FREEZING CONDITIONS, PLEASE EMPTY THE FLOWMETER TUBE ON THE CONTROL PANEL BY DISCONNECTING THE PRODUCTION HOSE AND BLOWING OR INJECTING AIR INTO THE HOSE, PROTECT YOUR MEMBRANES WITH BLANKETS.

5.1. Maintaining the membrane

After 1,000 working hours, it is normal that the flow lowers between 10 and 15%. If more, you should think of replacing the membranes.

- The volume of production of your watermaker can be made over the first 24 to 48 hours of operation. If the drinking water produced falls below the normal working specifications (sea water containing a TDS of 35,000 ppm, a sea water temperature of 25°C, and pressure of 65 bars), and if production is not improved by rinsing the membrane, then the membrane has to be replaced.

- Please take into consideration that the volume of drinking water produced is dependent on ideal sea water temperature and on pressure in the system. Therefore, if the volume of drinking water produced falls it does not necessarily mean that the membrane need to be replaced.

5.2. Rinsing the membranes

Once a week, the water maker needs to be flushed with fresh water before using it to make fresh water. There is no need to flush it with fresh water after each use, as this is just a waste of water that are taken from the boat's tank.

There are 2 methods to flush the system: manual and automatic.
Both systems are using the water that are in the tanks of the boat, and there is no use in water from the dock or a connection of any hose from a source outside the boat.

Remember: <u>The biggest enemy of the membranes is fresh water.</u>

Fresh water should be always used with no pressure when going through the system (pressure dial turned all the way anti clockwise) and the system should always run with no pressure after a fresh water flush to dump all the fresh water that are in it, before making freshwater from sea water (also with the pressure dial all the way anti clockwise).
When running the watermaker with the dial all the way anti clockwise, it will shut it self down automatically after 1 minute. Only then, the watermaker is ready for use.

5. Maintenance:

Manual Flush

Next to the pre filter there is a valve. The valve is connected to the fresh water system of the boat and turning it, will automatically start the boat's water pump and a flow of fresh water from the tank to the water maker.

1. **Don't turn the water maker ON**. Leave it on it's OFF position.
2. Turn the pressure dial all the way anti clockwise.
3. Turn the valve of the fresh water intake, which is located next to the filter, for 2 minutes. The boat's water pump will start and fresh water will run through the water maker.

Automatic Flush

After using the water maker, don't switch it off.

While the water maker is still running, turn the pressure dial all the way anti clockwise. The water maker will stop making water and will automatically start the flushing process. The green and orange lights on the control panel will turn on, which indicates that flushing is in process. This should take 30 seconds and will stop automatically. The green and orange lights will shut off and the only indicator will be the blue flashing light on the ON/OFF button, to remind you to shut the water maker OFF.

The automatic flush is a better way to flush the system since it's not only flushes the sea water out, it also back wash the pre-filter and dumps all the dirt and debris that accumulated in the filter's housing, back to the sea, through the sea water intake.

DON'T FORGET!!!

After each system flushing, before using the water maker you need to:

1. Make sure the pressure dial is turned all the way anti clcockwise.
2. Turn the water maker ON and let it run with no pressure for 1 minute until the red alarm light comes on. This is the time needed for the sea water to replace all the fresh water that are in the system, before running pressurized sea water through the membranes.

RUNNING FRESH WATER IN HIGH PRESSURE THROUGH THE MEMBRANES WILL DAMAGE THE MEMBRANES!!!

5. Maintenance:

5..3. STERILIZING THE MEMBRANE

When should the membrane be sterilized?

Normally, regular monthly rinsing of the membrane may be all that is required to maintain the membrane. If this is not possible, sterilization will be necessary. A sterilisation procedure should be carried out every six months.

Membrane sterilizing procedure:

1. Manual method: Thoroughly rinse the desalinator with fresh water for 10 minutes, using the three-way valve on the pre-filter. This procedure should be followed while the machine is idle. Pour the sterilizer (entire packet contents) into a bucket containing 8 litres of water. Disconnect the sea water inlet hose and immerse it in the bucket. Run the desalinator without increasing pressure until the bucket is empty. When the bucket is empty and the procedure is completed, the hose can be reconnected. If not, see number 3.

2. The sterilizing procedure can also be carried out using a garden spray: Pour the entire packet contents of sterilizer into a bucket containing 8 litres of fresh water and mix thoroughly. Fill the spray bottle with this mixture and spray the sterilizer into the water maker inlet, at a spray pressure of 3 to 4 bars. If not, see number 3.

3. Sterilizing cartridge ST2:
   We have developed a sterilizing cartridge which makes this procedure very simple and easy. Cartridge instructions are given in appendix A3. Before using the desalinator again simply rinse with fresh water for a few minutes using the three-way valve on the pre-filter and all traces of the sterilizer will be removed.

5.4. HP Pump

The HP pump is half filled with oil to the indicated level on the gauge. Normally no additional oil is needed throughout the life of the water maker. However, if refilling is necessary, use multi grade oil 15W40 and do not exceed the indicated level (in the middle of the red mark on the gauge which is on the back of the pump to the opposite of the pump head).

BEWARE: the sticker located on the red oil filling cap of the HP pump is there only for the shipment: it must be removed before use.

6. SPARE PARTS AND ACCESSORIES

Spare parts

Dessalator® systems are very reliable, hardwaring and do not generally require expensive services. Nevertheless an accident is always possible (running without enough water, accidental overpressure, impact,…).

Should the need arise, we supply spare parts and maintenance accessories:

- 5µm 10 ft filter
- driving belt
- motor relays
- production solenoid valve
- HP pump seals and valves
- HP hose (sold by meter)
- Connector for HP tube
- Flowmeter tube

Accessories:

- Sterilizing cartridge ST2
- Sterilizer bag
- Mineralizing cartridge

APPENDIX – A1

REVERSE OSMOSIS

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membrane. This waste, along with the remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids); approximately 2% of the 35,000 PPM/TDS will pass through the membrane. This guarantees drinking water with a TDS value of 500 (average). Please note that the drinking water produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with a slight dose of chlorine (or iodine) and it should be also mineralized to ensure it remains consumable. Pay attention not to allow pure chlorine (or a too high dose of chlorine) into the desalination system, as this could damage the device.

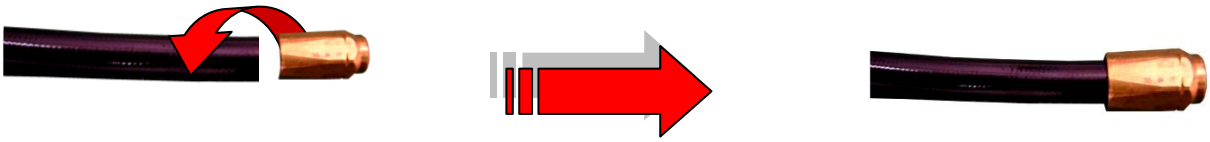
How does your desalinator work?

Sea water enters the inlet valve which penetrates the hull. This sea water is then routed through the 5 µm pre-filter. The filtered water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurised water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: If the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity > 1,000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel. The production capacity of fresh water is achieved with a sea water temperature of 25°C. The output drops by approximately 2,5 to 5% for each degree below 25°C.

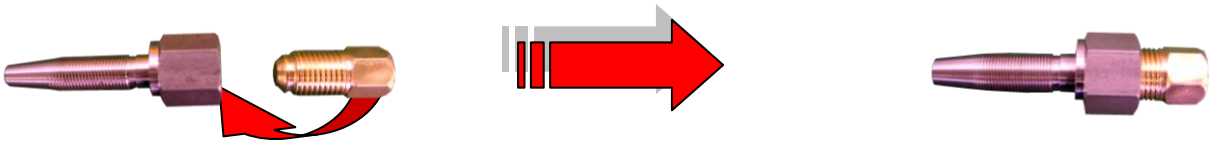
APPENDIX – A2

Installation instructions – HP Connectors

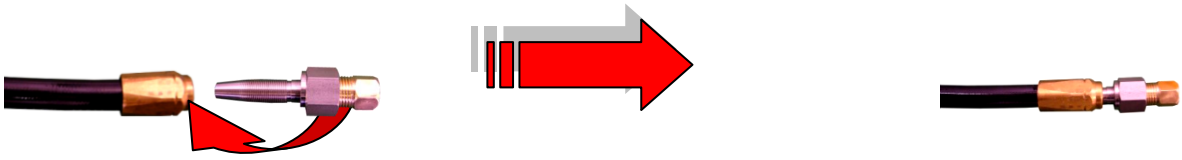
1. Screw the brass union (skirt) anti-clockwise onto the HP pipe, no more than 2.5cm. Stop where the inner threading disappears.



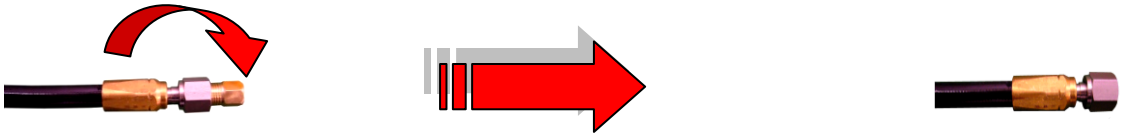
2. Insert the steel tapered end-piece into the stainless steel nut, and tighten very firmly on the male tapered union.



3. Lightly grease the tip of the stainless steel cone and screw it straight into the brass union. Stop where the steel threading disappears into the brass end-piece (a gap of approximately 7mm between the nut and the brass union)



4. Unscrew the nut of the tapered adaptor. The connector is now ready for the hose from pump to membrane. We recommend using an insulating pipe to protect it against vibrations.



5. IMPORTANT: Check carefully that the end-piece does not block the hose:

- Please don't forget to put Loctite or watertight product on the male and female cones when remounting.
- Please check that the HP connector is not blocked up.
  - ➢ either by blowing into the hose
  - ➢ or by inserting a screwdriver to check free passage.

APPENDIX – A3

Sterilizing cartridge – instructions for use

The desalinator is not running:

1. Close the sea water inlet valve.
2. Open the sterilizing cartridge
3. Remove the top grid
4. Place the foam filter at the bottom of the filter
5. Pour the powder into the cartridge
6. Replace the top grid and close the cartridge
7. Check that the seal is properly positioned.
8. Dismantle the basin of the pre filter
9. Remove the 5µm cartridge from the pre-filter.

Remove the 5µm cartridge from the pre-filter

10. Replace with the sterilizing cartridge ST2

Replace the 5µm cartridge with the sterilizing cartridge ST2

11. Set the rinsing valve to pressurized fresh water and rinse, leaving a little sterilizer in the filter.
12. At this point, the desalinator must be switched off
13. The sterilisation remains effective for six months at most. (Repeat after this time as necessary).

Caution: Before next use, rinse the desalinator thoroughly with fresh water for 15 minutes and ensure that the sterilizing cartridge has been removed and replaced by a 5 µm cartridge.

BEWARE: The ST2 cartridge is reusable.

APPENDIX – A4

Your DESSALATOR® is equipped with an automated rinsing.
Please find here below the procedure if you choose the manual rinsing.

MANUAL RINSING

Your Dessalator® is equipped with an automated rinsing.
Here below the procedure to rinse manually.

Manual rinsing and sterilization:
Valve handle to the back.

Normal position for a use with sea water:
Valve handle to the front

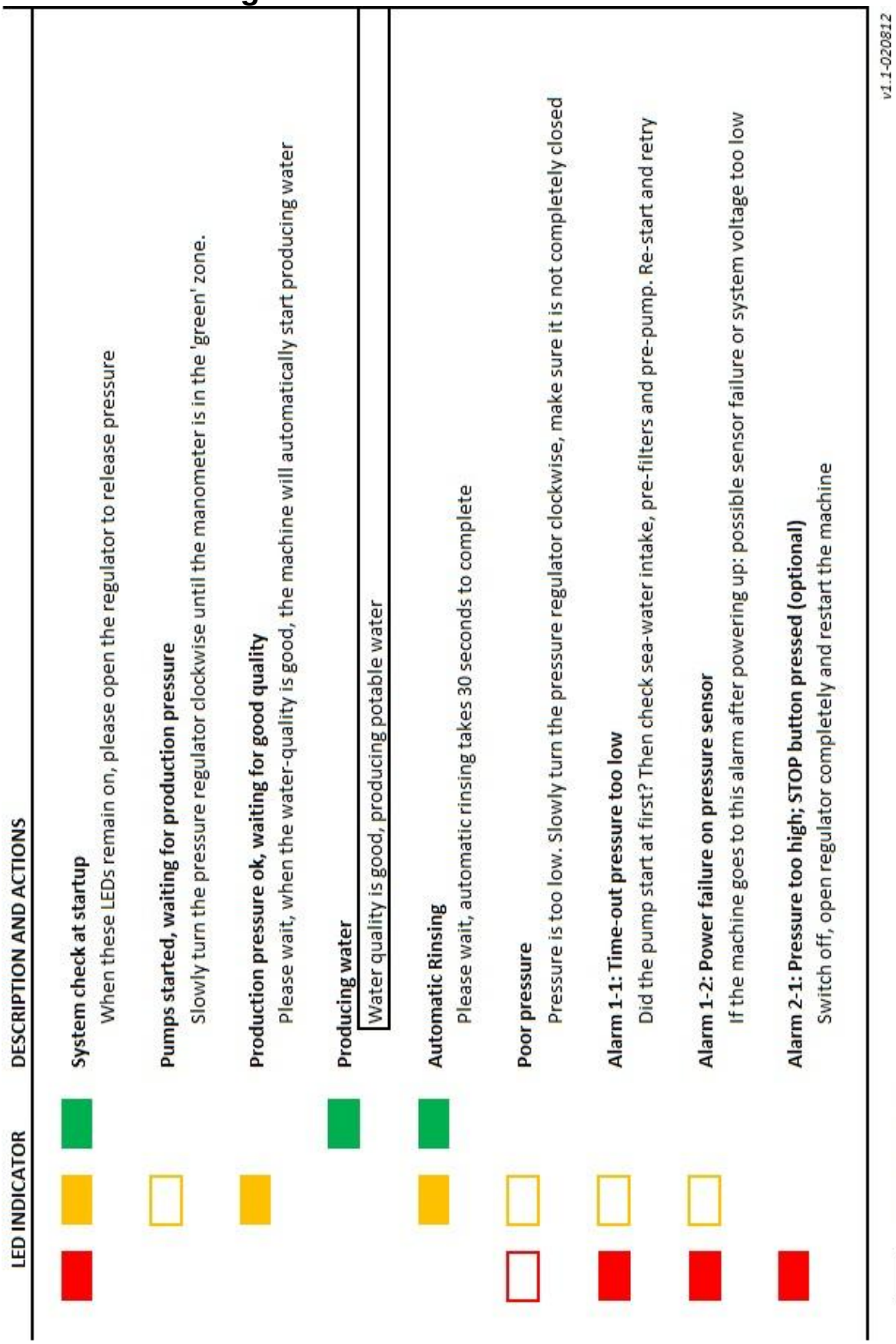
APPENDIX – A5

Troubleshooting

PROBLEM	CAUSE	SOLUTIONS
Leak on the pressure regulator in front of the control panel	Loosened regulation cable gland	Tighten the cable gland with a 12 wrench.
Noisy HP pump.	- Reduced water inlet or air inlet in the system. - Leak on pump head seals.	- Ensure correct size of hoses (diameter), clips and filters secure and filters clean. - Replace seals.
Oil leak on HP pump	Worn seals on connecting rods	- Replace the seals.
Insufficient water flow	- Very cold water - Dirty pre filter - Tension drop on the power cable	- Replace the pre filter - Recharge batteries - Check the connection. - Inadequate power cable section, reinforce cable section.
Water leak under the HP head	- Worn seals	- Replace plunger seals
No pressure reading	Insufficient water	Open the hull valve and / or the rinsing valve
Pressure doesn't come up.	Dirty pump valves	Dismantle and clean the valves in the pump head

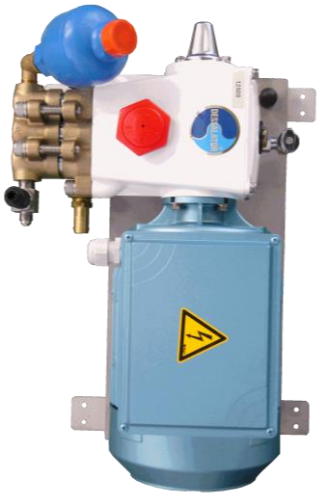
APPENDIX – A5

Troubleshooting: led indicator



USER'S MANUAL
INSTALLATION OF A DESSALATOR
90 TO 200 LITRES / HOUR IN 120, 230 OR 400 V

REMOTE CONTROL VERSION



COMPACT VERSION

DESSALATOR

Technical and Sales Departments:
Z.I des 3 Moulins – « Euro 92 » – Bât. D – rue des Cistes – 06600 ANTIBES

Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
e-mail: contact@dessalator.com
Web site: www.dessalator.com

Version A3

CONTENTS

Installation diagram Dessalator D90-200 horizontal front panel, 230 V or 400 V.

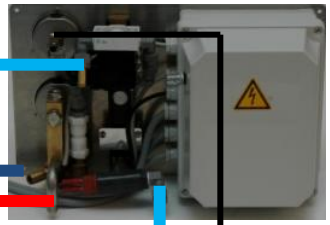
Legend:

① Rinsing valve control

Sea water
Fresh water
HP hose from pump to membranes
Electric cable

Production 3

6 8



Fresh water tank

Membranes
D90: 1190x110x110
D160: 1190x190x110
D200: 1190x260x110

Control panel
Width: 220
Height: 440
Depth: 170

Electric box
Width: 180
Height: 160
Depth:260

4 **230 V power supply of the boat**

Sea waterline

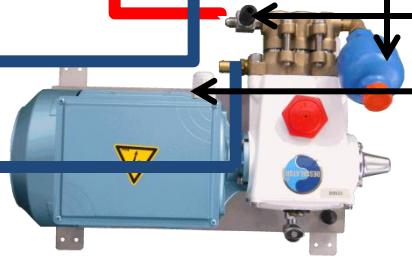
Waste outlet

12

Pressure switch

230V motor

For rinsing with pressurized fresh water (Pump of the boat).



Rinsing valve ①

Double filter
Width: 360
Height: 390
Depth: 180

Motor unit -90 and 160/200
Length: 490/510
Width: 340/340
Height: 310/320

Strainers towards the front of the boat (to bail when sailing)

Low pressure

DESSALATOR, Z.I. des 3 Moulins-282, rue des Cistes- Bât. « Euro 92 » D, F- 06600 Antibes, France.
Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 E-mail: contact@dessalator.com

Installation diagram Dessalator D90-200 Vertical front panel, 230 V or 400 V.

Legend:

- (1) Rinsing Solenoid valve control
- Sea water
- Fresh water
- HP pump hose to membranes
- Electric cable

Control panel
Width 220
Height: 440
Depth: 170

Electric box
Width: 180
Height: 160
Depth:260

Production 3

6

8

Membranes
D90: 1190x110x110
D160: 1190x190x110
D200: 1190x260x110

Multiconductor

Fresh water tank

4

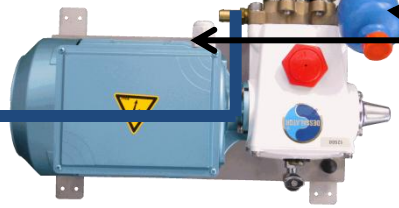
230 V power supply of the boat

Sea waterline

Waste outlet

12

Pressure switch

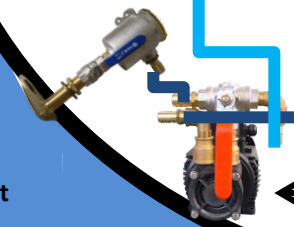


Motor - 230 V

For the rinsing with pressurized fresh water (Pump of the board).

Rinsing valve

1



Double filter
Width: 360
Height: 390
Depth: 180

Motor unit 90 and 160/200
Length: 490/510
Width: 340/340
Height: 310/320

Strainers towardst the front of the boat to bail when sailing)

Low pressure

DESSALATOR, Z.I. des 3 Moulins-282, rue des Cistes- Bât. « Euro 92 » D, F - 06600 Antibes, France.
Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 E-mail: contact@dessalator.com

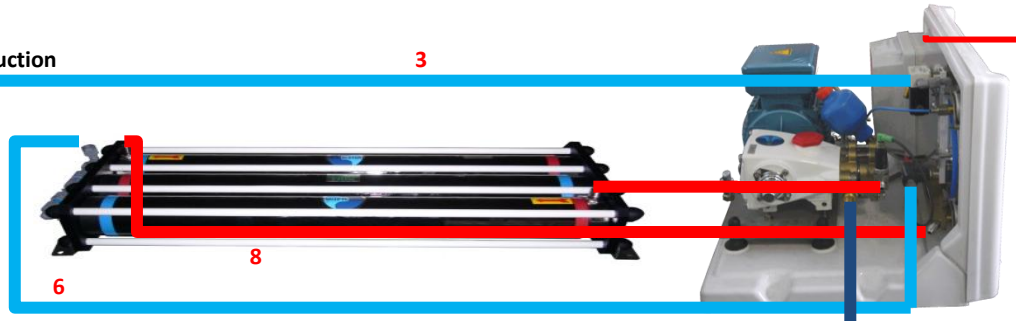
Installation diagram Dessalator D90-200 Compact version, 230 V or 400 V.

Legend:

① Rinsing valve control

Sea water
Fresh water
HP hose from Pump to membranes
Electric cable

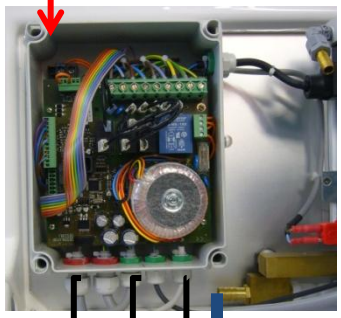
Production 3



Fresh water tank

Membranes
D90: 1190x110x110
D160: 1190x190x110
D200: 1190x260x110

Compact
Width: 580
Height: 480
Depth: 380



Sea waterline

Rejet 12

For rinsing with pressurized fresh water (Pump of the boat).

230 V power supply of the boat

Rinsing valve ①

Double filter
Width: 360
Height: 390
Depth: 180

Strainers towards the front of the boat (to bail when sailing)

Low pressure pump

DESSALATOR, Z.I. des 3 Moulins-282, rue des Cistes- Bât. « Euro 92 » D, F-06600 Antibes, France.
Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 E-mail: contact@dessalator.com

2. COMPONENTS SUPPLIED ACCORDING TO WATERMAKER TYPE:

Version A3

Hull valve:

The ¾ hull valve strainer filters out the larger particles at system entrance.

Pre-pump:

Fixed under the waterline it enables water to flow through the pre-filters to the HP motor unit. For a manual rinsing or following to the filter replacement, please put the valve handle to the right and fill the circuit with fresh water during 3 or 4 minutes, then put the valve handle back to the bottom.

Pre-filters:

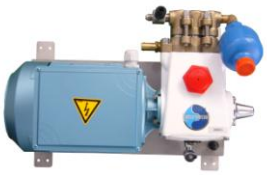
The first 25µm cartridge filters out rough particles and the second 5µm cartridge refines the treatment. For automatic rinsing an electro-valve is mounted.

Motor unit:

HP motor unit either in compact frame or with remote control. It allows water to be pressurised to 60-65 bars.

Compact Version:
Motor with integrated control

Remote control version:
Motor and control panel are separated



Control panel:

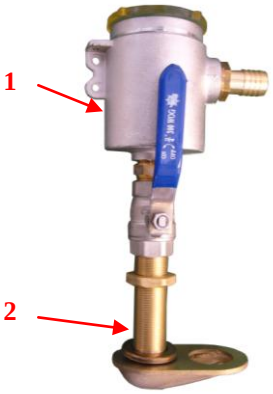
The control panel is either part of frame (compact version) or separated (horizontal or vertical version) and it manages the functions of the desalinator.

Horizontal version

Vertical version

Compact version

DESALINATOR 90 TO 200 LITRES / HOUR
3.1 INSTALLATION INSTRUCTIONS



Sea water inlet valve[1] ¾:

The sea water inlet valve should be positioned as low as possible below the waterline and should be accessible. The grooves on the strainer should be facing forward (towards the bow) for maximum water intake when the boat is moving forward. The underwater installation should be sealed with Rubson or Sicaflex. The valve and the hose connector can be installed using a tube made watertight with 577 or 542 Loctite.
The pre filter should be connected to the low pressure pump using a Tricoflex hose 19 mm inner diameter, with 2 stainless jubilee clips at each joint, with their tightening heads positioned diametrically opposite, on the hose. The hull penetration drilling diameter must be 27mm.

Recommendation: ensure that the immersed part of the valve is painted with underwater grade paint.

Bronze pre-filter

The basket pre-filter is directly fixed to the hull inlet valve[2],

Cartridge pre-filter:

There are two parts to the cartridge pre-filter. In order to allow the filter cartridges to be removed, 5cm space should be left below the pre-filters. A key is supplied to dismantle the filters. Anchoring clip is reversible. An electro valve is mounted on the outlet for automatic rinsing (Ø 15).

Recommendation: When replacing the pre-filter cartridge, be careful not to position the pre-filters above water-sensitive parts, for risk of them getting wet. Check that the O-ring seal for the basin is secure and that the bleeder screw is tightened.

DESALINATOR 90 TO 200 LITRES / HOUR
3.2 INSTALLATION INSTRUCTIONS

Pre-pump:

The pre-pump with its rinse valve[3] (with exception of “Solo” version) should be installed as low as possible in the boat and should be easily accessible. The pressurised fresh water pipe should be connected to the valve to facilitate rinsing the desalinator. See water and electricity connection plan enclosed at the beginning of the manual (according to the model).

Recommendation: Remember to attach two stainless jubilee clips to each joint.

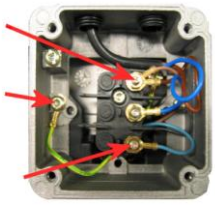
THE PUMP SHOULD NOT BE PLACED WHERE THERE IS A RISK OF WATER SPRAY.

Pump cable case 220V

phase

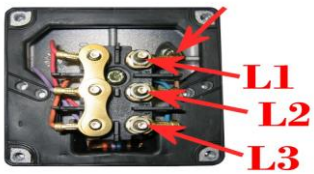
earth

neutral



Pump cable case 380V

Earth



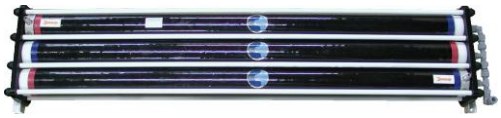
CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

DESALINATOR 90 TO 200 LITRES / HOUR
3.3 INSTALLATION INSTRUCTIONS

Membrane(s) according to desired water flow:

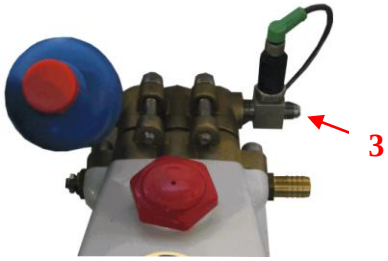
1 membrane for 90 litres / hour water production (1190x110x110mm)

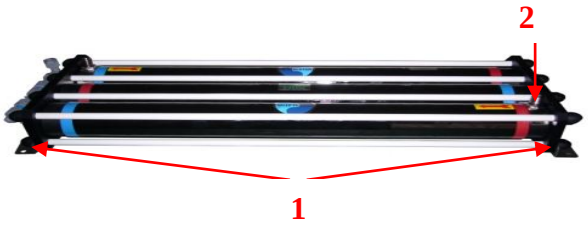
2 membranes for 160 litres / hour water production (1190x190x110mm)



3 membranes for 200 litres / hour water production (1190x260x110mm)

The membranes can be installed horizontally, preferably flat or on a wall support. They are mounted using 8 Parker screws in *stainless steel brackets*[1]. The number of membranes used depends on the desired water flow. Hose from the HP pump should join the membranes at the red ring[2]. As the hose from the HP pump vibrates, it is preferable that it is installed using an insulating pipe[3]. The HP connectors should be installed strictly in accordance with the connection plan (see page 9). Please apply a little Loctite or nut seal on the two male and female cones, before tightening.





Recommendation: To facilitate the attachment to the HP stainless steel joins[2], it is possible to rotate the heads through 90°, by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Then remove the rod to obtain access, and rotate the membrane head using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the unit.

DESALINATOR 90 TO 200 LITRES / HOUR
3.4 INSTALLATION INSTRUCTIONS

Control panels in accordance with your watermaker version:

Vertical version:

Front panel

Back panel

Horizontal version:

Front panel

Back panel

Compact version:

Front panel

Back panel

All remote control panels must be mounted on a vertical surface. Installing the panels close to the watermaker system facilitates the piping and hose connections.

Figures for each connection are as follows: (see diagrams at the beginning of the manual).

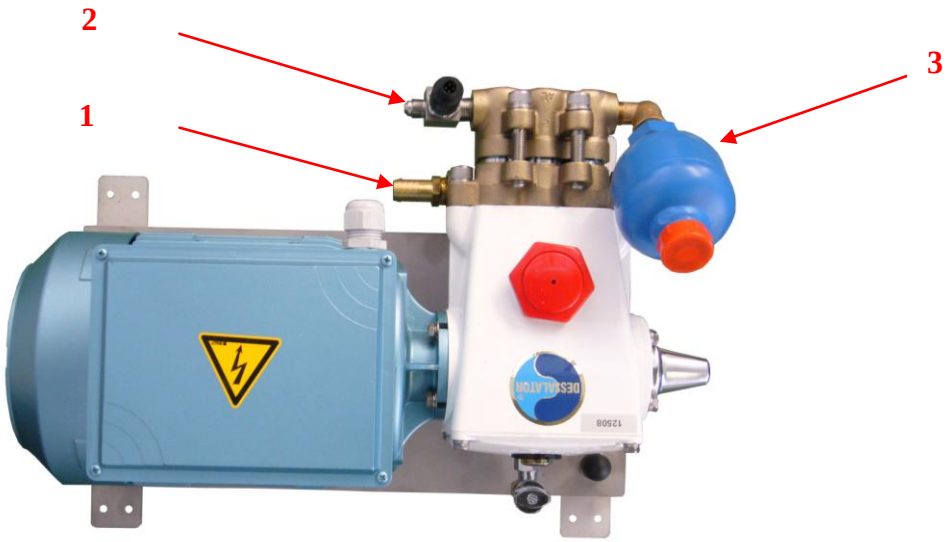
- N°8 (red mark): HP piping exiting the membranes.
- N°6 (blue hose 8/10mm diameter) production hose exiting the membranes.
- N°3: Production hose from panel to tanks. A 10mm inner diameter Tricoflex length will be required which should be connected either to the fresh water tanks or to the fresh water pump provided there is no constricting valve on the fresh water tank outlet.
- N°12: Waste outlet: 15mm inner diameter Tricoflex.
- N°4: 4mm capillary hose (6m are provided) to be connected to the side of the HP pump and to the low pressure gauge.

DESALINATOR 90 TO 200 LITRES / HOUR
3.5 INSTALLATION INSTRUCTIONS

High pressure motor unit:

There are three water connections to the pump head:

- A 15mm diameter pipe[1] from the pre-filters.
- A HP hose[2] to the 8mm diameter membranes (see installation diagrams at the beginning of the manual).
- A capillary 4mm diameter tube[3]: this must be clipped into its connector. To remove it, just push the black ring and remove it at the same time. The HP unit should be installed in a horizontal position and must be protected from water spray. Connections are illustrated below:

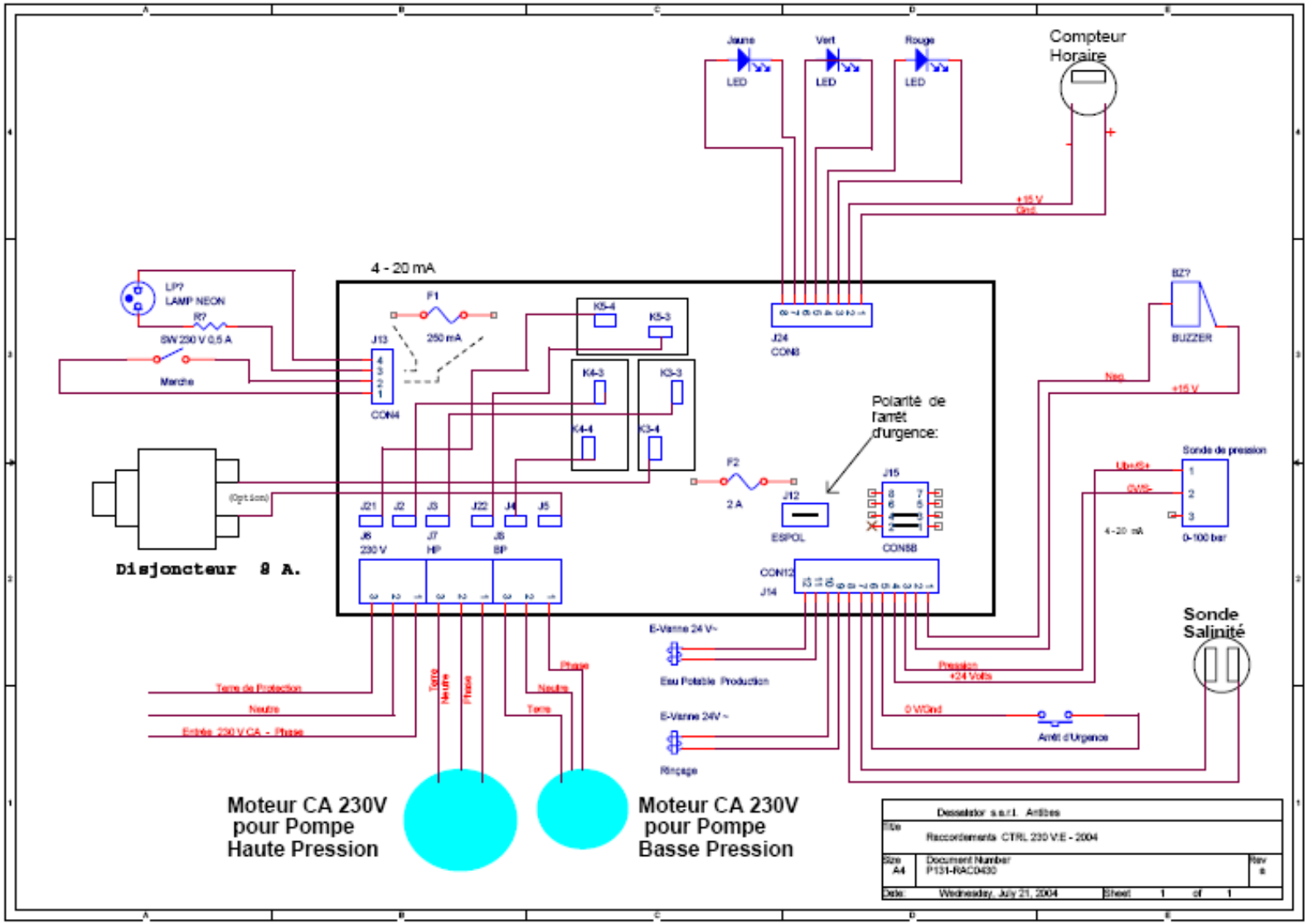


Additional hardware needed for assembly:

- miscellaneous screws (including Parker)
- assortment of stainless jubilee clips 10mm, 16mm and 19mm diameter
- miscellaneous tie wraps
- insulating piping 22mm diameter
- Tricoflex hoses 10, 15 and 19mm diameter.

DESALINATOR 90 TO 200 LITRES / HOUR

3.5 INSTALLATION INSTRUCTIONS



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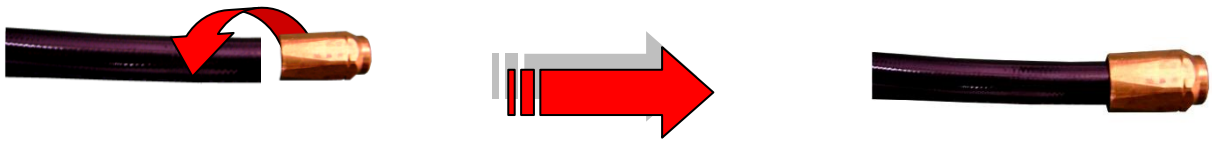
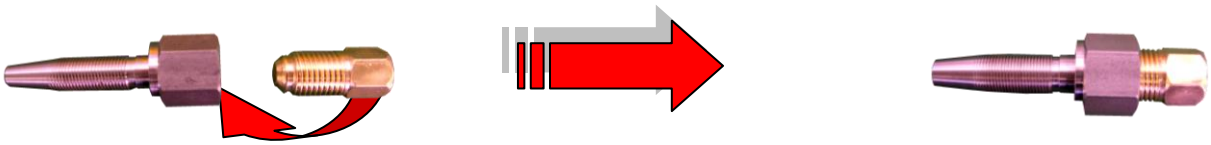
DESALINATOR 90 TO 200 LITRES / HOUR
3.7 INSTALLATION INSTRUCTIONS - HP CONNECTORS

Installation instructions – HP Connectors

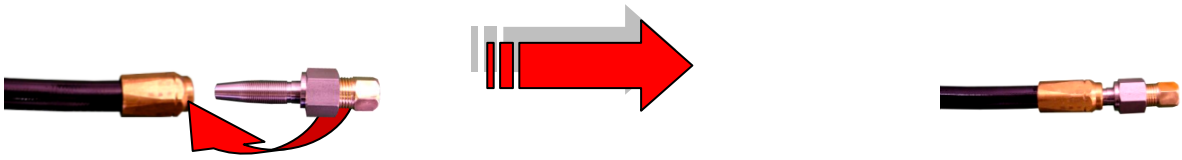
1. Screw the brass union (skirt) anti-clockwise onto the HP pipe, no more than 2.5cm. Stop where the inner threading disappears.



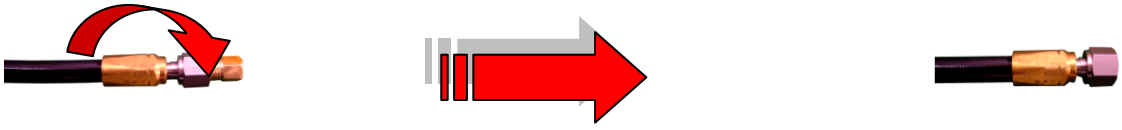
2. Insert the steel tapered end-piece into the stainless steel nut, and tighten very firmly on the male tapered union.



3. Lightly grease the tip of the stainless steel cone and screw it straight into the brass union. Stop where the steel threading disappears into the brass end-piece (a gap of approximately 7mm between the nut and the brass union)



4. Unscrew the nut of the tapered adaptor. The connector is now ready for the hose from pump to membrane. We recommend using an insulating pipe to protect it against vibrations.



5. IMPORTANT: Check carefully that the end-piece does not block the hose:

- Please don't forget to put Loctite or watertight product on the male and female cones when remounting.
- Please check that the HP connector is not blocked up.
    a. either by blowing into the hose
    b. or by inserting a screwdriver to check free passage.

.

DESALINATOR 90 TO 200 L/H
4. DIRECTIONS FOR USE

1. Ensure the valves are open before starting up the desalinator.

2. **To be done compulsory:**
   For the first use, after the replacement of the filter, when lifting the boat out of the water or for a long period of not using your water maker, please fill the circuit with fresh water: put the handle valve on the pre pump to the right; this operation should be done for 3 or 4 minutes, water maker stopped and pressure captor open (fully anti-clockwise). Once the circuit is full of fresh water put the valve handle on the low pressure pump back to the bottom.

3. To start the desalinator, the pressure regulator must be open. Switch on: the low pressure pump will start than the high pressure pump will automatically start.

4. Turn the pressure regulator dial to the right, until the HP gauge reading is in the green zone.

5. Fresh water quality and flow into the tank is automatically monitored by the electronics board.

6. If pressure becomes too high the desalinator will cut out and the red indicator will light up. If this occurs, reduce pressure and restart the desalinator.

7. To shut down the desalinator, reduce pressure: switch off and stop the machine.

8. To shut down the desalinator with rinsing, please see pages 13 and 14.

9. If the desalinator is not used for extended periods of time, it should be rinsed preferably once a month. If not, please remember to sterilize the membranes (with our special sterilization cartridge) for a storage valid for a period of max. 6 months.

Note: Fresh water production depends on the temperature of the sea water and on the cleanliness of the pre-filters, together with the right voltage of the generating unit.

DESALINATOR 90 TO 200 L/H
5. REVERSE OSMOSIS PRINCIPLE

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membranes. This waste, along with the remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids); approximately 2% of the 35,000 PPM/TDS will pass through the membranes. This guarantees drinking water with a TDS value of 500 (average). Please note that the drinking water produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with a slight dose of chlorine (or iodine) to ensure it remains consumable. Pay attention not to allow pure chlorine (or a too high dose of chlorine) into the desalination system, as this could damage the device.

How does your desalinator work?

Sea water enters the inlet valve which penetrates the hull. This sea water is then routed by the pre-pump through the 25 µm and 5 µm pre-filters. The filtered water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurized water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: If the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity > 1,000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel.

DESALINATOR 90 TO 200 L/H
5.1 REVERSE OSMOSIS PRINCIPLE

MEMBRANES - DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of the reverse osmosis system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the desalinator is achieved with a sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water and on the sailing area. Output drops by approximately 2.5% to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C. Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C, as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid, either sea water before treatment, fresh water provisionally stored or sterilizing liquid, if the desalinator is not used for extended periods of time (Sterilizer is effective for six months and must be replaced after this period of time).

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the desalinator in Marinas. **The system is not recommended for use in muddy or polluted water (briny water, river, Red Sea), which can clog and damage the membranes**. However, if the desalinator has to be used in such conditions, only run it for very short periods and as soon as clean sea water becomes available rinse the membranes and run the system without pressure for 30 minutes with the pressure regulator open.

DESALINATOR 90 TO 200 L/H
6. MAINTENANCE

6.1. Maintaining the membrane

After 1,000 working hours, it is normal that the flow lowers between 10 and 15%. If more, you should think of replacing the membranes.

- The volume of production of your watermaker can be made over the first 24 to 48 hours of operation. If the drinking water produced falls below the normal working specifications (sea water containing a TDS of 35,000 ppm, a sea water temperature of 25°C, and pressure of 65 bars), and if production is not improved by rinsing the membrane, then the membrane has to be replaced.

- Please take into consideration that the volume of drinking water produced is dependent on ideal sea water temperature and on pressure in the system. Therefore, if the volume of drinking water produced falls it does not necessarily mean that the membrane need to be replaced.

6.2. Rinsing the membranes

Once a week, the watermaker needs to be flushed with fresh water before using it to make fresh water. There is no need to flush it with fresh water after each use, as this is just a waste of water that are taken from the boat's tank.

There are 2 methods to flush the system: manual and automatic.
Both systems are using the water that is in the tanks of the boat, and there is no use in water from the dock or a connection of any hose from a source outside the boat.

Remember: <u>The biggest enemy of the membranes is fresh water.</u>

Fresh water should be always used with no pressure when going through the system (pressure dial turned all the way anti clockwise) and the system should always run with no pressure after a fresh water flush to dump all the fresh water that are in it, before making freshwater from sea water (also with the pressure dial all the way anti clockwise).
When running the watermaker with the dial all the way anti clockwise, it will shut it self down automatically after 1 minute. Only then, the watermaker is ready for use.

6. Maintenance:

Manual Flush

On the pre pump there is a valve. The valve is connected to the fresh water system of the boat and turning it, will automatically start the boat's water pump and a flow of fresh water from the tank to the watremaker.

1. **Don't turn the watermaker ON**. Leave it on it's OFF position.
2. Turn the pressure dial all the way anti clockwise.
3. Turn the valve of the fresh water intake, which is located on the pre pump, for 2 minutes. The boat's water pump will start and fresh water will run through the watermaker.

Automatic Flush

After using the watermaker, don't switch it off.
While the watermaker is still running, turn the pressure dial all the way anti clockwise. The watermaker will stop making water and will automatically start the flushing process. The green and orange lights on the control panel will turn on, which indicates that flushing is in process. This should take 30 seconds and will stop automatically. The green and orange lights will shut off and the only indicator will be the blue flashing light on the ON/OFF button, to remind you to shut the watermaker OFF.

The automatic flush is a better way to flush the system since it's not only flushes the sea water out, it also back wash the pre-filter and dumps all the dirt and debris that accumulated in the filter's housing, back to the sea, through the sea water intake.

DON'T FORGET!!!

After each system flushing, before using the watermaker you need to:

1. Make sure the pressure dial is turned all the way anti clcockwise.
2. Turn the watermaker ON and let it run with no pressure for 1 minute until the red alarm light comes on. This is the time needed for the sea water to replace all the fresh water that is in the system, before running pressurized sea water through the membranes.

RUNNING FRESH WATER IN HIGH PRESSURE THROUGH THE MEMBRANES WILL DAMAGE THE MEMBRANES!!!

CAUTION: IN FREEZING CONDITIONS, PLEASE EMPTY THE FLOWMETER TUBE ON THE CONTROL PANEL BY DISCONNECTING THE PRODUCTION HOSE AND BLOWING OR INJECTING AIR INTO THE HOSE, PROTECT YOUR MEMBRANES WITH BLANKETS.

6.3 STERILIZING THE MEMBRANES

When should the membranes be sterilized?

Normally, regular monthly rinsing of the membranes may be all that is required to maintain the membranes. If this is not possible, sterilization will be necessary.

Membrane sterilizing procedure:

1. Manual method: Thoroughly rinse the desalinator with fresh water for 10 minutes using the three-way valve on the low pressure pump. This procedure should be followed while the machine is idle. Pour the sterilizer (entire packet contents) into a bucket containing 8 litres of water. Disconnect the sea water inlet hose and immerse it in the bucket. Run the desalinator without increasing pressure until the bucket is empty. When the bucket is empty and the procedure is completed and the hose can be reconnected. If not, see number 3.

2. The sterilizing procedure can also be carried out using a garden spray: Pour the entire packet contents of sterilizer into a bucket containing 8 litres of fresh water and mix thoroughly. Fill the spray bottle with this mixture and spray the sterilizer into the watermaker valve opening inlet, at a spray pressure of around 3 to 4 bars. If not, see number 3.

3. Sterilizing cartridge ST2:
   We have developed a sterilizing cartridge which makes this procedure very simple and easy. Cartridge instructions are given on the next page. Before using the desalinator again simply rinse with fresh water for a few minutes using the three-way valve on the pre-pump and all traces of the sterilizer will be removed.

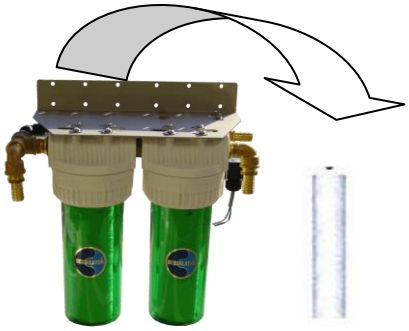
6.4 HP Pump

The HP pump is half filled with oil to the indicated level. Normally it is done for 500 hours. If refilling is necessary, use multi grade oil 15W40 and do not exceed the indicated level (in the middle of the red mark on the gauge which is on the back of the pump to the opposite of the pump head).

BEWARE: the sticker located on the red oil filling cap of the HP pump is there only for the shipment: it must be removed before use.

7. INSTRUCTIONS FOR STERILIZATION OF THE MEMBRANES WITH OUR ST CARTRIDGE

1. Close the sea water inlet valve.
2. Open the sterilizing cartridge
3. Remove the top grid
4. Place the foam filter at the bottom of the filter
5. Pour the powder into the cartridge
6. Replace the top grid and close the cartridge
7. Check that the seal is properly positioned.
8. Remove the 5µm cartridge from the pre-filter.



Remove the 5µm cartridge from the **2nd pre-filter**

9. Replace with the sterilizing cartridge

Replace the 5µm cartridge (in the **2nd pre-filter)** with the sterilizing cartridge.

10. Set the rinsing valve to pressurized fresh water and leave a little sterilizer in the filter.
11. Do not run the desalinator at this point.
12. The sterilization remains effective for six months at most. (Repeat after this time as necessary).

IMPORTANT: Before next use, rinse the desalinator thoroughly with fresh water for 15 minutes. Ensure that the sterilizing cartridge has been removed and replaced by a 5 µm cartridge.

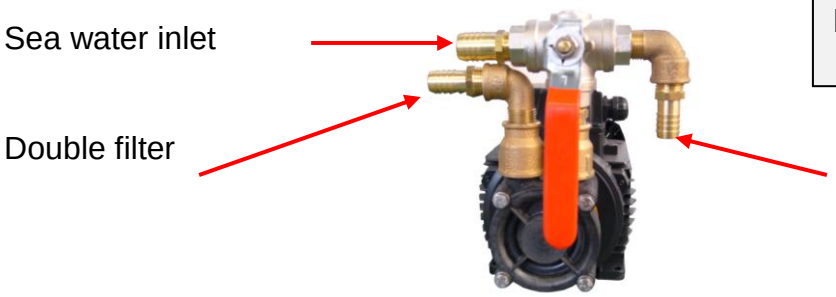
BEWARE: **The ST2 cartridge is reusable**.

DESALINATOR 90 TO 200 L/H
8. MANUAL RINSING

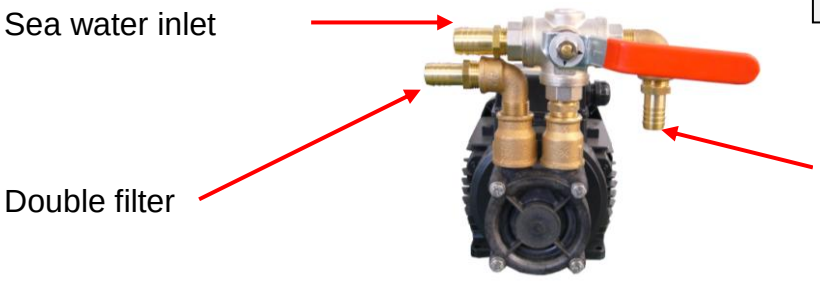
Your Dessalator® is equipped with an automated rinsing.
Here below the procedure to rinse manually.

Manual Rinsing

Normal position for sea water use :
Valve handle to the bottom.



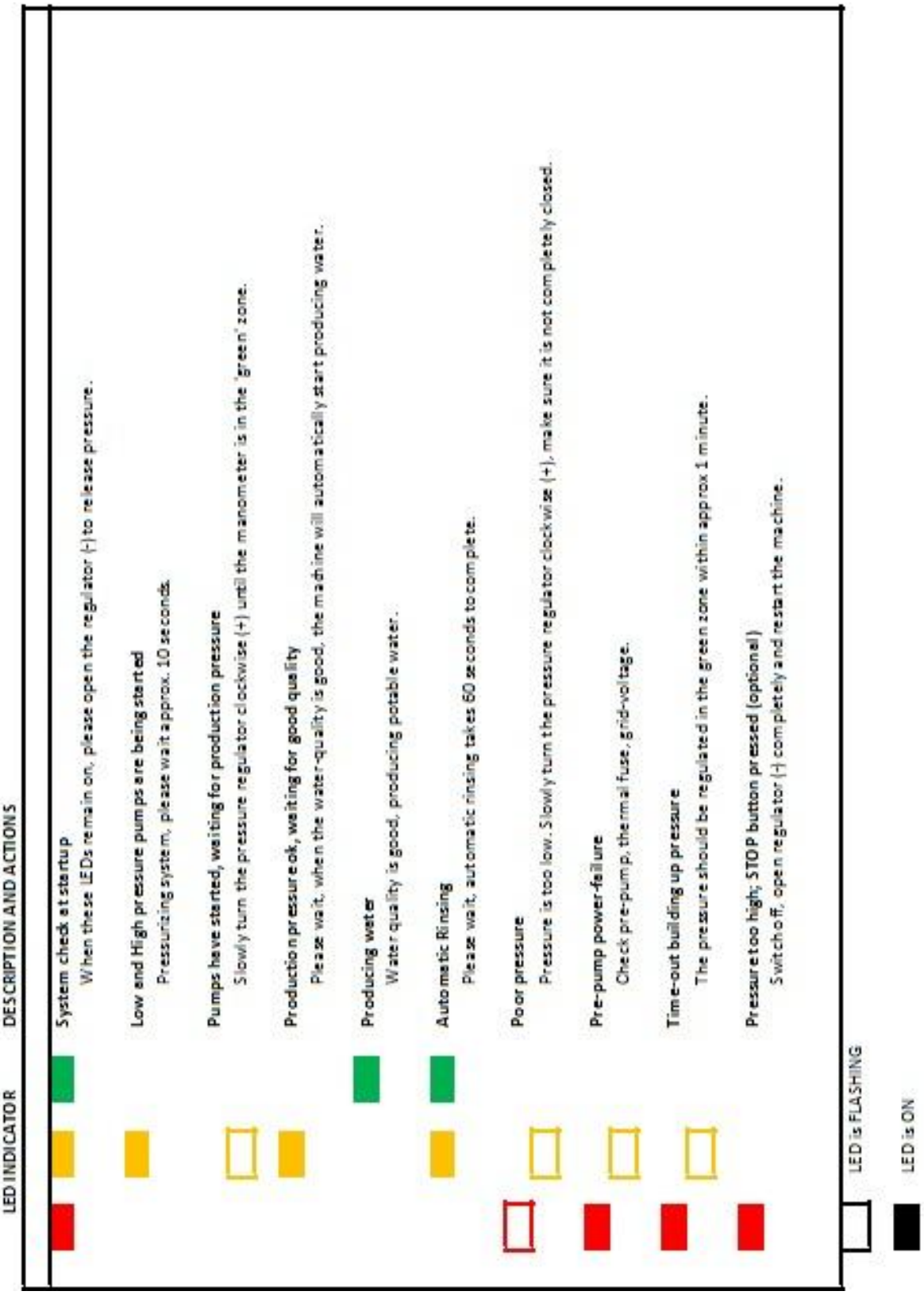
Manual rinsing and sterilization :
Valve handle to the right.



DESALINATOR 90 TO 200 L/H
9. TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTIONS
Leak on the pressure regulator in front of the control panel	Loosened regulation cable gland	Tighten the cable gland with a 17 wrench.
No reading on the low pressure gauge	- valve closed - Pre-pump impeller stuck - Dirty pre-filters	- *Check the valves* - *Turn the pump fan with a screwdriver or clean the pump body.* - *Change the filters.*
Noisy HP pump.	- reduced water inlet or air inlet in the system. - residues in the pump valves.	- *Ensure correct size of pipes (diameter), clips and filters secure and filters clean.* - *Open the pump head and clean the 6 valves.*
Red Alarm light illuminated. Power cut while pressure rising.	HP switch	- *Tighten the screw on top of switch below the connector.*
Red light continuously illuminated.	Check the two thermals in the electric box.	- *Reset the two thermal push buttons under the relays* - *High and low pressure*
Variations in speed of the electric motors	- Generating unit too weak - Voltage error - Wrong frequency - Dirty fuel filter.	- *Service the generating unit and address adjustments and maintenance.*
Three-way valve	- No rinsing - No sea water - Handle incorrectly mounted.	*Fix the handle correctly.*

DESALINATOR 90 TO 200 L/H
9. TROUBLESHOOTING



USER'S MANUAL
DUO100® installation and utilisation

First bi powered water maker world-wide, producing 100 L/Hr,
with automatic rinsing – model patented

DESSALATOR

Technical and Sales Departments :
Z.I des 3 Moulins – « Euro 92 » – Bât. D – rue des Cistes – 06600 ANTIBES
FRANCE

Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
e-mail: contact@dessalator.com
Web site: www.dessalator.com

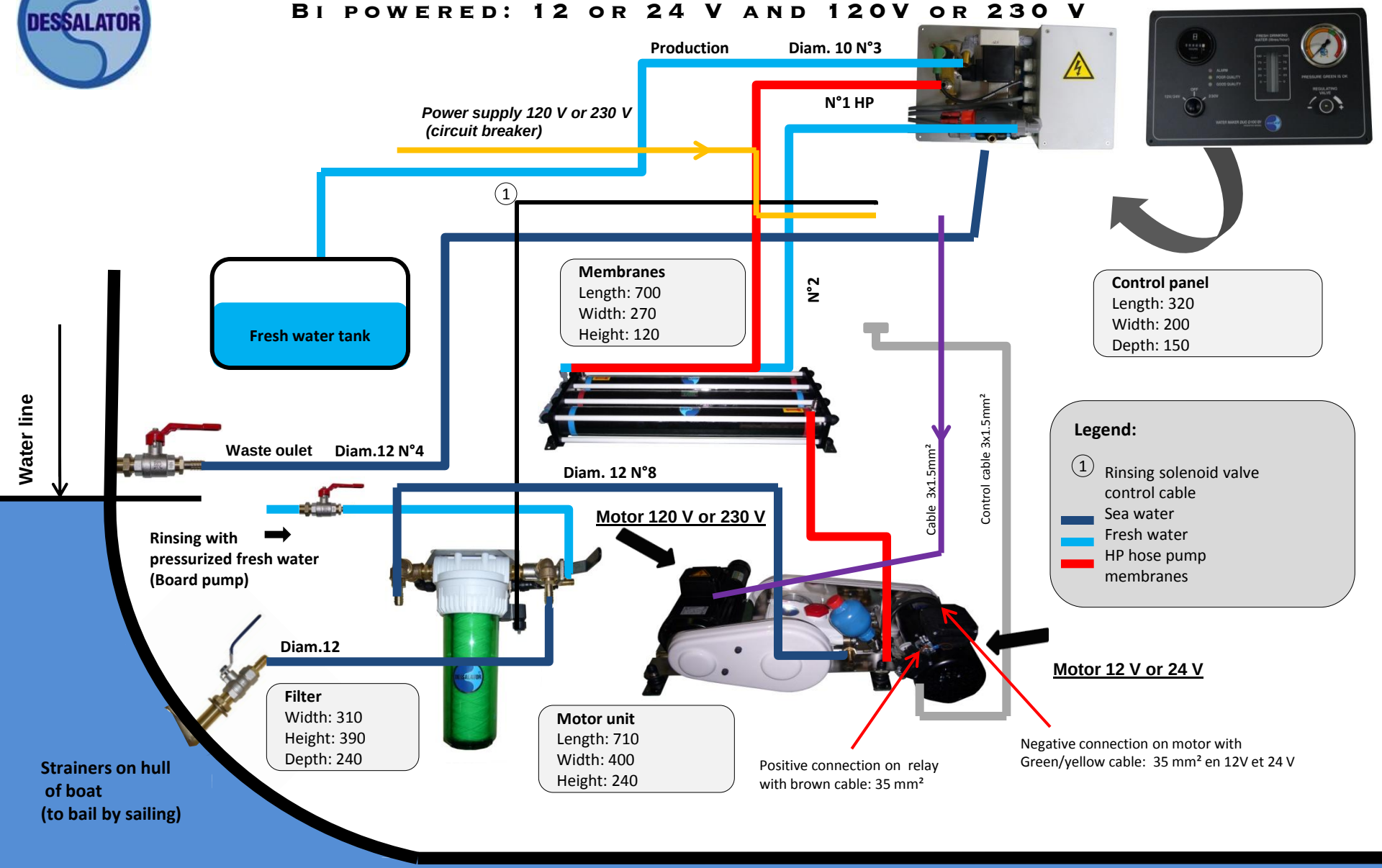
Version A3

CONTENTS

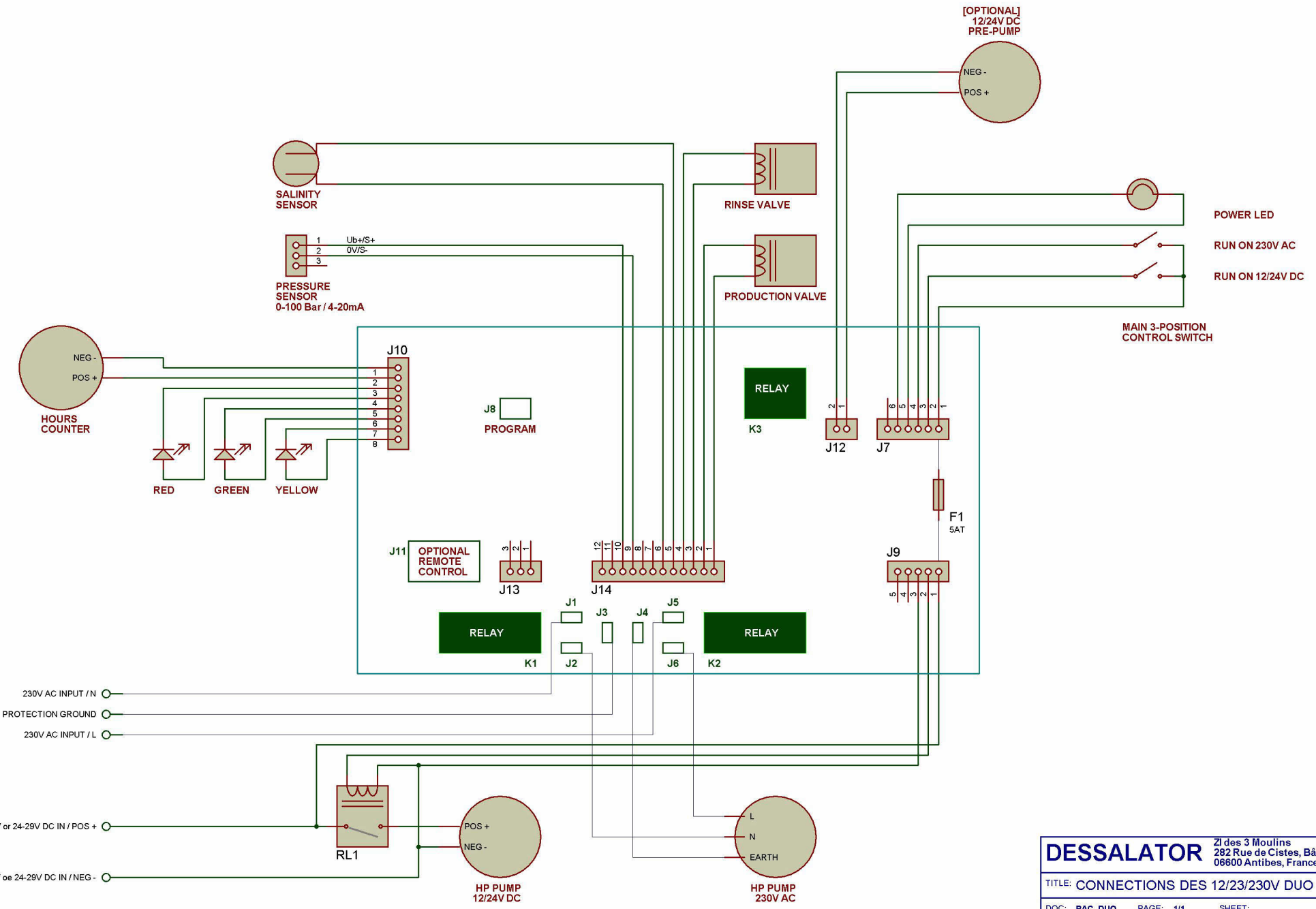
Appendix:

Connections plan: Connections DES 12/23/230V DUO- Doc : RAC_DUO – 4/12/10

Installation diagram Dessalator Duo100
Bi powered: 12 or 24 V and 120V or 230 V



DESSALATOR, Z.I. des 3 Moulins-282, rue des Cistes- Bât. « Euro 92 » D, 06600 Antibes .
Tél: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 e-mail: contact@dessalator.com



DESSALATOR

ZI des 3 Moulins
282 Rue de Cistes, Bâtiment Euro 92
06600 Antibes, France

TITLE: CONNECTIONS DES 12/23/230V DUO

DOC:	RAC_DUO	PAGE:	1/1	SHEET:	
REV:	A	DATE:	04/12/10	AUTHOR:	VAK

GREENTRONICS BV - THE NETHERLANDS

1. Components supplied with the Dessalator®:

Version A3

Hull valve:
It must be located the lowest possible in the boat, to the back for a motor yacht or in the centre near the keel for a sailing boat.
The hull valve strainer filters out the larger particles at system entrance.

Pre-filter:
It must be located the nearest possible to the hull valve and be compulsory under the waterline. If not possible, there is a solution: to install a LP pump (optional).
The pre-filter filters out solid particles down to 5 µm at the motor unit inlet. It is supplied with wrench. For automatic rinsing, an electro valve is mounted.

Motor unit:
It must be located compulsory under the waterline.
The motor unit is comprised of the 12 or 24 V motor and the 120 or 230 V motor. **It should be installed in a well-ventilated space**. **BEWARE**: In **120V**, please think of an even **more important ventilation of the motor unit** than in 230V.

Membrane unit:
The membrane unit includes 3 membranes 2521 assembled in a compact frame.

According to the model, a fuse or a circuit breaker is supplied.

Control panel:
includes a HP gauge, a flowmeter, an on/off switch, a pressure adjustment knob, an operating time meter, 3 indicator lights.

Pipes and hoses supplied by Dessalator®:

- High pressure pipes pump/membranes and membranes/control panel (2 pipes and 4 special connectors)
- Water production pipe membrane / control panel.

Additional hardware needed for assembly:

- Miscellaneous screws (including Parker)
- Stainless jubilee clips ∅ 10mm and ∅12mm
- Assortment of plastic rings (tie wraps)
- Teflon tape or insulating water proof tape
- Silicon Rubson mastic, Sicaflex or equivalent
- Ribbed insulating pipe for cables and HP tubes
- Tricoflex hoses ∅ 10mm and ∅ 12mm
- Power cable: 35mm² for the 12V and 20mm² for the 24V
- Various tools (electric drill, saw, …)

2. How to install the watermaker:

2.1 Sea water inlet

Sea water inlet valve:

The strainer should be positioned as low as possible below the waterline and as far as possible from the deck waste oulet. Drill the hull ∅ 21mm. The grooves on the strainer should be facing forward (towards the bow) for maximum water intake when the boat is moving forward. Please seal watertight with Rubson mastic or Sicaflex and ensure that the immersed part is painted with underwater grade paint.
The hull valve should be accessible for maintenance. Make the valve / strainer and valve / hose connector watertight using 577 Loctite or Teflon tape.

Cartridge pre-filter:

The pre-filter should also be positioned as low as possible below the waterline and it should remain accessible. The mounting bracket is reversible, which facilitates the height positioning. The hose connection must be done with 12mm inner diameter Tricoflex for all the sea water circuit and the pressurized rinsing. Don't forget to place two stainless steel collars on each connection. 5cm space should be left below the filter body to allow the filter basin to be removed. A wrench is supplied to dismantle the filter. The fresh water pressurized rinsing must be connected to the output of your board pump. An electro-valve is mounted on the output (diam. 12) for automatic rinsing. It can be connected under a sink, a wash basin or on the way of pressurized cold water hoses. The valve handle must be positioned to the front when the water maker is working. For a manual rinsing, please move the valve handle to the back. When replacing the filter cartridge, please check that the O-ring seal for the basin is secure and that the bleeder screw is tightened and fill the circuit without pressure with fresh water again for 3 to 4 minutes, put then the handle to the front.

Connections:

Hull valve / three-way valve, Pre-filter / pump, Fresh water / three-way valve
The sea water inlet valve should be connected to the pre-filter using a tricoflex hose of inner ∅ 12mm, for sea water circuit and rinsing under pressure. Mount two jubilee clips at each joint, with their tightening heads positioned diametrically opposite on the hose. Connect the pressurized fresh water from the water oulet to the three-way valve. This connection can be made under a sink, wash basin or anywhere on the length of the pressurized fresh water pipe. When operating in sea water mode, the valve handle should be positioned in line with the filter (see photo above).

Recommendation:

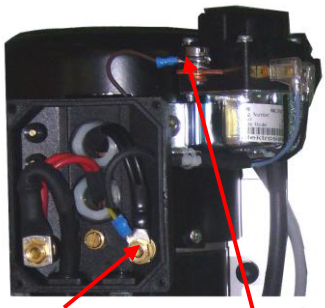
If the pipe must pass through dividing walls or touch sharp edges, use an insulating pipe or tube superior to the pipe diameter to protect it against wear and friction.

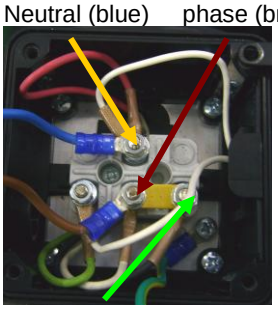
2. How to install the DUO 100:

2.2 Motor unit:

The HP motor unit should be installed as low as possible in the boat in a horizontal position and it must be protected from water spray as much as possible. The unit is mounted using two brackets under the two motors leaving a few centimetres clear space around the unit, to get sufficient air circulation space for motor cooling. The connection between the prefilter[1] oulet and the inlet to the low pressure side of the pump[2] is in Tricoflex hose of ∅ 12mm with doubled stainless jubilee clips at each joint.
The HP head of the pump is connected to the membrane inlet (red mark) through an HP pipe, cut to the appropriate length (see installation of connectors appendix A2).
Apply a little liquid Loctite or nut seal on the male and female cones before joining.

2.3 Electrical connections:



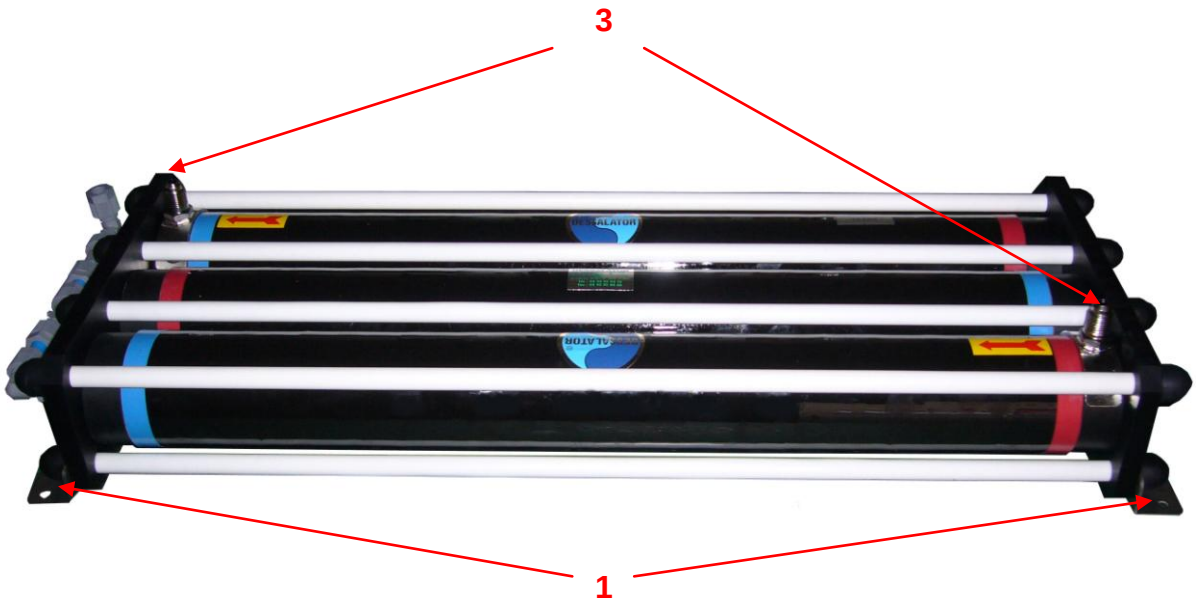


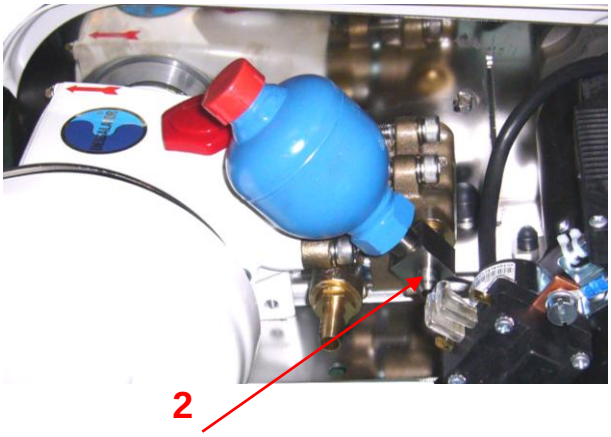
CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

When connecting the 12 or 24V motor ensure that the polarity is correct: positive (brown wire[3]) on the relay and negative (green/yellow wire[4]) on the 12 or 24V motor. Depending on the voltage install a 12V fuse holder (supplied) or a 24V circuit breaker (supplied) on the positive cable. Ensure that the cable is of sufficient diameter: 35mm² for the 12V or 20mm² for the 24V.
The Dessalator control cable is 5m long and is equipped with a plug with a pin locator system. The Dessalator® can only be operated when the power cable is connected to a DC supply.
The 120 V or 230 V motor is connected using the cable from the control panel, taking care to respect the connections on the terminal strip.

2. How to install the desalinator:

2.4 Membrane unit



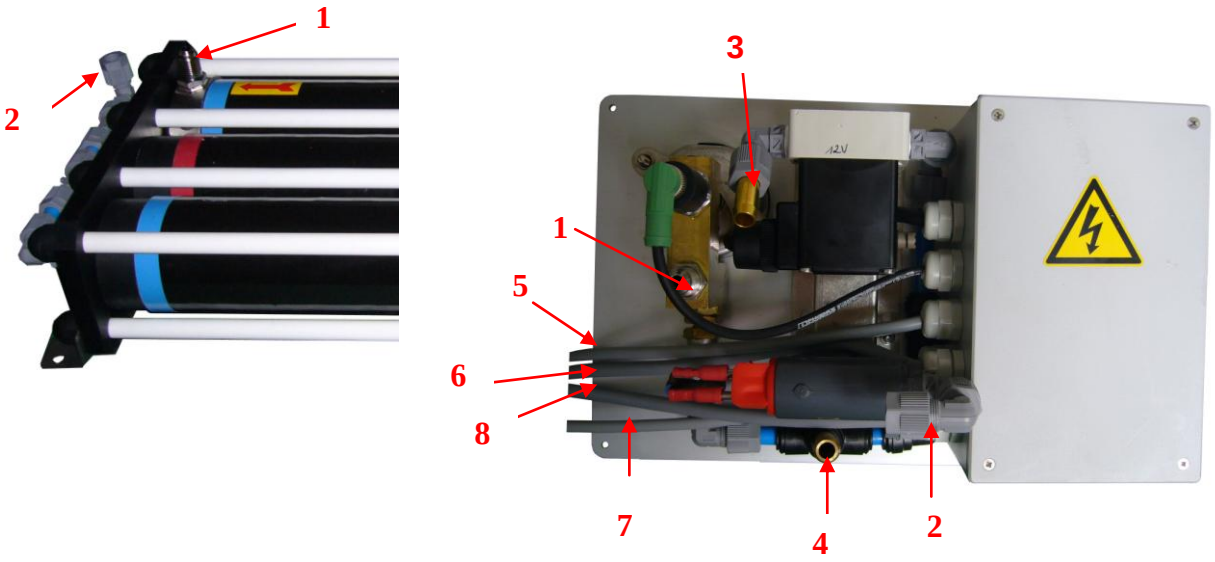


The membranes can be installed horizontally, preferably flat or on a wall support. They are mounted using 8 Parker screws in *stainless steel brackets*[1]. As the hose from the HP pump[2] vibrates, it is preferable to install the hose with an insulating tube. The HP connectors should be installed strictly in accordance with the instructions (Appendix A2). Apply a little loctite or nut seal to the two male and female cones before tightening.

Recommendation: To facilitate the connection[3], it is possible to rotate the heads through 90° by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Remove the rod to obtain access and rotate the membrane head using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the assembly.

2. How to install the desalinator:

2.5 Control panel:



The control panel must be mounted on a vertical surface as close as possible to the motor / pump unit and to the membranes. Leave space behind the panel to facilitate the connections. It is recommended that it is installed at the bottom or on the sides of cupboards, under chart table or main cabin seats, on the front panel of a rear bunk…

The panel has the following water connections:

- HP hose[1]
- Production hose exiting the membranes (blue hose)[2]
- Production hose from panel to tanks[3]: a 10mm inner ∅ Tricoflex hose will be required which must be connected either to the fresh water tanks or to the distribution manifold on the fresh water unit inlet provided there is no constricting valve on the fresh water tank outlet.
- A Tricoflex waste oulet inner ∅ 12mm hose[4] will also be required which can be connected to a sink, wash basin or cockpit water drain, to avoid having the hull redrilled. If this is not possible, remember to open the outlet valves before using the Dessalator.

Electrical connection:

- The 12 or 24V motor power cable[5] with a connector and pin location system is connected to the cable exiting the 12 or 24V motor.
- The 120 or 230V motor power cable[6] (mentioned on the cable) of 6m length is to be connected from the control panel to the 120 or 230V control panel of the boat. The supplied circuit-breaker must be positioned on this line, if you haven't one already available on your boat (Beware: 6 Amps minimum).
- The second 120 or 230V cable[7] (6m) must be connected to the connection box of the 120 or 230V motor (see plan enclosed).
- The connection of the solenoid valve has to be connected with cable[8] .

3. Starting the DUO:

1. Ensure the valves are open before starting up the watermaker (Hull valve and waste oulet valve if relevant)

2. **To be done compulsory:**
   For the first use, after the replacement of the filter, when lifting the boat out of the water or for a long period of not using your water maker, please fill the circuit with fresh water: put the handle valve on the pre filter to the back; this operation should be done for 3 or 4 minutes, water maker stopped and pressure captor open (fully anti-clockwise). Once the circuit is full of fresh water put the valve handle of the pre filter to the front.

3. It is important to take account of the ampere capacity of the batteries and of the working duration: for a use without any risk, it is better to start the motor of the boat.

4. To start the watermaker, the pressure regulator must be open. Switch on.

5. Turn the pressure regulator dial to the right until the HP gauge reading is in the orange zone then gradually adjust until the needle reaches the beginning of the green zone. Check that the pressure remains constant. The purpose of this operation is to remove air from the system and to obtain a more constant pressure while the watermaker is running.

6. Fresh water quality and flow into the tank is automatically monitored by the electronics board.

7. If pressure becomes too high the watermaker will cut out and the red indicator will light up. If this occurs, reduce pressure, switch off and restart the watermaker.

8. To shut down the watermaker: switch off then reduce pressure.

9. To shut down with rinsing, please see instructions page 8 and 9.

10. If the watermaker is not used for extended periods of time it should be rinsed preferably once a month. If not, the membranes will have to be sterilized for the storage (for 6 months).

Note: Fresh water production depends on the temperature of the sea water and on the cleanness of the 5µm pre-filter.

4. Directions for use:

MEMBRANES DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of the system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the desalinator is achieved with a sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water. Output drops by approximately 2.5% to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C. Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid either sea water before treatment, fresh water provisionally stored or sterilizing liquid if the desalinator is not used for extended periods of time (See sterilization methods appendix A3). Sterilizer is effective for six months and must be replaced after this period of time.

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the desalinator in Marinas. **The system is not recommended for use in muddy or polluted water (briny water, river, Red Sea), which can clog the pre-filter and damage the membranes**. However, if the desalinator has to be used in such conditions only run it for very short periods, as soon as clean sea water becomes available rinse the membrane and run the system without pressure for 30 minutes with the pressure regulator open.

5. Maintenance:

CAUTION: IN FREEZING CONDITIONS, PLEASE EMPTY THE FLOWMETER TUBE ON THE CONTROL PANEL BY DISCONNECTING THE PRODUCTION HOSE AND BLOWING OR INJECTING AIR INTO THE HOSE, PROTECT YOUR MEMBRANES WITH BLANKETS.

5.1. Maintaining the membrane

After 1,000 working hours, it is normal that the flow lowers between 10 and 15%. If more, you should think of replacing the membranes.

- The volume of production of your watermaker can be made over the first 24 to 48 hours of operation. If the drinking water produced falls below the normal working specifications (sea water containing a TDS of 35,000 ppm, a sea water temperature of 25°C, and pressure of 65 bars), and if production is not improved by rinsing the membrane, then the membrane has to be replaced.

- Please take into consideration that the volume of drinking water produced is dependent on ideal sea water temperature and on pressure in the system. Therefore, if the volume of drinking water produced falls it does not necessarily mean that the membrane needs to be replaced.

5.2. Rinsing the membranes

Once a week, the watermaker needs to be flushed with fresh water before using it to make fresh water. There is no need to flush it with fresh water after each use, as this is just a waste of water that is taken from the boat's tank.

There are 2 methods to flush the system: manual and automatic.
Both systems are using the water that are in the tanks of the boat, and there is no use in water from the dock or a connection of any hose from a source outside the boat.

Remember: <u>The biggest enemy of the membranes is fresh water.</u>

Fresh water should be always used with no pressure when going through the system (pressure dial turned all the way anti clockwise) and the system should always run with no pressure after a fresh water flush to dump all the fresh water that are in it, before making freshwater from sea water (also with the pressure dial all the way anti clockwise).
When running the watermaker with the dial all the way anti clockwise, it will shut it self down automatically after 1 minute. Only then, the watermaker is ready for use.

5. Maintenance:

Manual Flush

Next to the pre filter there is a valve. The valve is connected to the fresh water system of the boat and turning it, will automatically start the boat's water pump and a flow of fresh water from the tank to the watermaker.

1. **Don't turn the watermaker ON**. Leave it on it's OFF position.
2. Turn the pressure dial all the way anti clockwise.
3. Turn the valve of the fresh water intake, which is located next to the filter, for 2 minutes. The boat's water pump will start and fresh water will run through the watermaker.

Automatic Flush

After using the watermaker, don't switch it off.

While the watermaker is still running, turn the pressure dial all the way anti clockwise. The watermaker will stop making water and will automatically start the flushing process. The green and orange lights on the control panel will turn on, which indicates that flushing is in process. This should take 30 seconds and will stop automatically. The green and orange lights will shut off and the only indicator will be the blue flashing light on the ON/OFF button, to remind you to shut the watermaker OFF.

The automatic flush is a better way to flush the system since it's not only flushes the sea water out, it also back wash the pre-filter and dumps all the dirt and debris that accumulated in the filter's housing, back to the sea, through the sea water intake.

DON'T FORGET!!!

After each system flushing, before using the watermaker you need to:

1. Make sure the pressure dial is turned all the way anti clockwise.
2. Turn the watermaker ON and let it run with no pressure for 1 minute until the red alarm light comes on. This is the time needed for the sea water to replace all the fresh water that are in the system, before running pressurized sea water through the membranes.

RUNNING FRESH WATER IN HIGH PRESSURE THROUGH THE MEMBRANES WILL DAMAGE THE MEMBRANES!!!

5. Maintenance:

5.3. STERILIZING THE MEMBRANE

When should the membrane be sterilized?

Normally, regular monthly rinsing of the membrane may be all that is required to maintain the membrane. If this is not possible, sterilization will be necessary. A sterilisation procedure should be carried out every six months.

Membrane sterilizing procedure:

1. Manual method: Thoroughly rinse the desalinator with fresh water for 10 minutes, using the three-way valve on the pre-filter. This procedure should be followed while the machine is idle. Pour the sterilizer (entire packet contents) into a bucket containing 8 litres of water. Disconnect the sea water inlet hose and immerse it in the bucket. Run the desalinator without increasing pressure until the bucket is empty. When the bucket is empty and the procedure is completed, the hose can be reconnected. If not, see number 3.

2. The sterilizing procedure can also be carried out using a garden spray: Pour the entire packet contents of sterilizer into a bucket containing 8 litres of fresh water and mix thoroughly. Fill the spray bottle with this mixture and spray the sterilizer into the watermaker inlet, at a spray pressure of 3 to 4 bars. If not, see number 3.

3. Sterilizing cartridge ST2:
   We have developed a sterilizing cartridge which makes this procedure very simple and easy. Cartridge instructions are given in appendix A3. Before using the desalinator again simply rinse with fresh water for a few minutes using the three-way valve on the pre-filter and all traces of the sterilizer will be removed.

5.4. HP Pump

The HP pump is half filled with oil to the indicated level on the gauge. Normally no additional oil is needed throughout the life of the watermaker. However, if refilling is necessary, use multi grade oil 15W40 and do not exceed the indicated level (in the middle of the red mark on the gauge which is on the back of the pump to the opposite of the pump head).

BEWARE: the sticker located on the red oil filling cap of the HP pump is there only for the shipment: it must be removed before use.

6. SPARE PARTS AND ACCESSORIES

Spare parts

Dessalator® systems are very reliable, hardwaring and do not generally require expensive services. Nevertheless an accident is always possible (running without enough water, accidental overpressure, impact,…).

Should the need arise, we supply spare parts and maintenance accessories:

- 5µm 10 ft filter
- driving belt
- motor relays
- production solenoid valve
- HP pump seals and valves
- HP hose (sold by meter)
- Connector for HP tube
- Flowmeter tube

Accessories:

- Sterilizing cartridge ST2
- Sterilizer bag
- Mineralizing cartridge

APPENDIX – A1

REVERSE OSMOSIS

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membrane. This waste, along with the remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids); approximately 2% of the 35,000 PPM/TDS will pass through the membrane. This guarantees drinking water with a TDS value of 500. Please note that the drinking water produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with chlorine or iodine and it should be also mineralized to ensure it remains consumable. Pay attention not to allow chlorine into the desalination system, as this could damage the device.

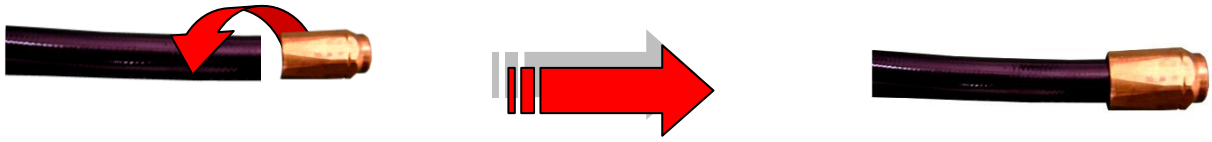
How does your desalinator work?

Sea water enters the inlet valve which penetrates the hull. This sea water is then routed through the 5 µm pre-filter. The filtered water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurised water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: If the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity > 1,000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel. The production capacity of fresh water is achieved with a sea water temperature of 25°C. The output drops by approximately 2,5 to 5% for each degree below 25°C.

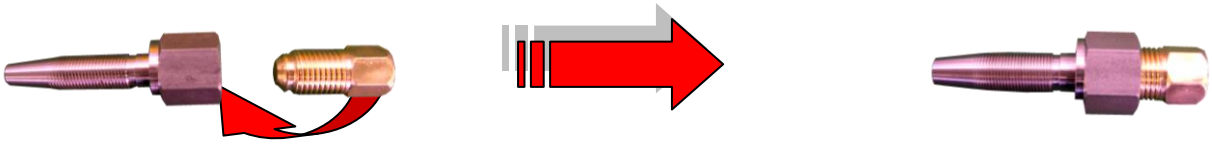
APPENDIX – A2

Installation instructions – HP Connectors
DESSALATOR

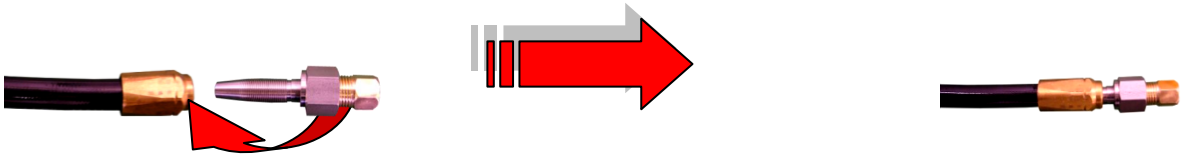
1. Screw the brass union (skirt) anti-clockwise onto the HP pipe, no more than 2.5cm. Stop where the inner threading disappears.



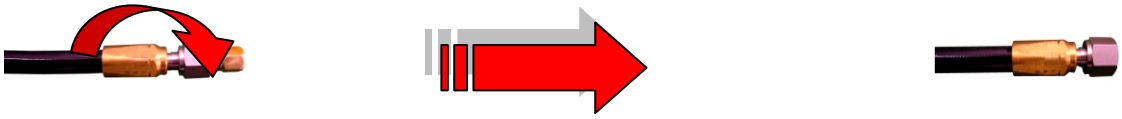
2. Insert the steel tapered end-piece into the stainless steel nut, and tighten very firmly on the male tapered union.



3. Lightly grease the tip of the stainless steel cone and screw it straight into the brass union. Stop where the steel threading disappears into the brass end-piece (a gap of approximately 7mm between the nut and the brass union)



4. Unscrew the nut of the tapered adaptor. The connector is now ready for the hose from pump to membrane. We recommend using an insulating pipe to protect it against vibrations.



5. IMPORTANT: Check carefully that the end-piece does not block the hose:

- Please don't forget to put Loctite or watertight product on the male and female cones when remounting.
- Please check that the HP connector is not blocked up.
  - ➢ either by blowing into the hose
  - ➢ or by inserting a screwdriver to check free passage.

APPENDIX – A3

Sterilizing cartridge – instructions for use

The desalinator is not running:

1. Close the sea water inlet valve.
2. Open the sterilizing cartridge
3. Remove the top grid
4. Place the foam filter at the bottom of the filter
5. Pour the powder into the cartridge
6. Replace the top grid and close the cartridge
7. Check that the seal is properly positioned.
8. Dismantle the basin of the pre filter
9. Remove the 5µm cartridge from the pre-filter.

Remove the 5µm cartridge from the pre-filter

10. Replace with the sterilizing cartridge ST2

Replace the 5µm cartridge with the sterilizing cartridge ST2

11. Set the rinsing valve to pressurized fresh water and rinse until all traces of the sterilizer have been removed.

12. At this point, the desalinator must be switched off

13. The sterilisation remains effective for six months at most. (Repeat after this time as necessary).

Caution: Before next use, rinse the desalinator thoroughly with fresh water for 15 minutes and ensure that the sterilizing cartridge has been removed and replaced by a 5 µm cartridge.

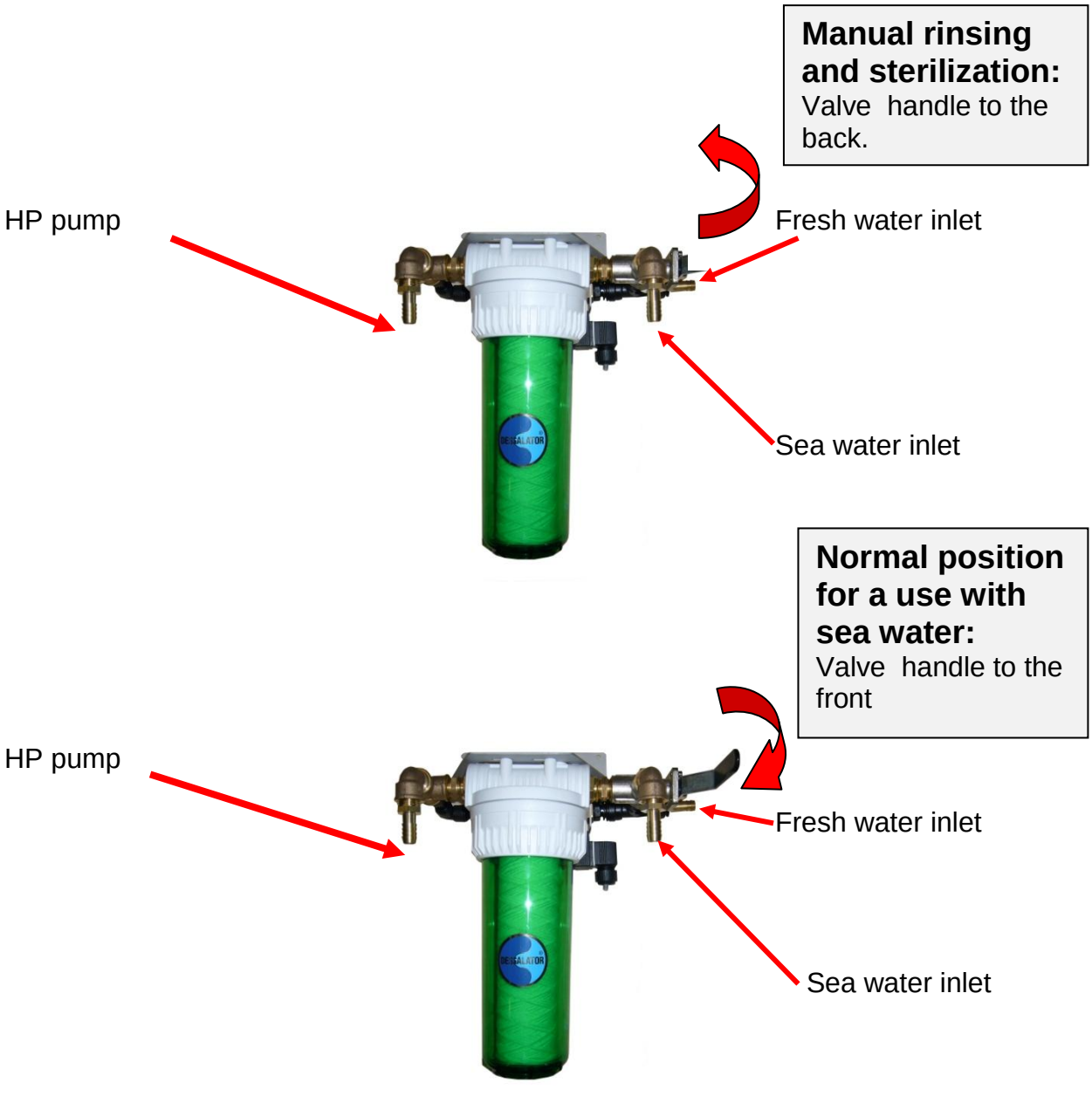
BEWARE: this cartridge is reusable!

APPENDIX – A4

Your DESSALATOR® is equipped with an automated rinsing.
Please find her below the procedure if you wish to rinse it manually.

MANUAL RINSING

Your Dessalator® is equipped with an automated rinsing.
Here below the procedure to rinse manually.



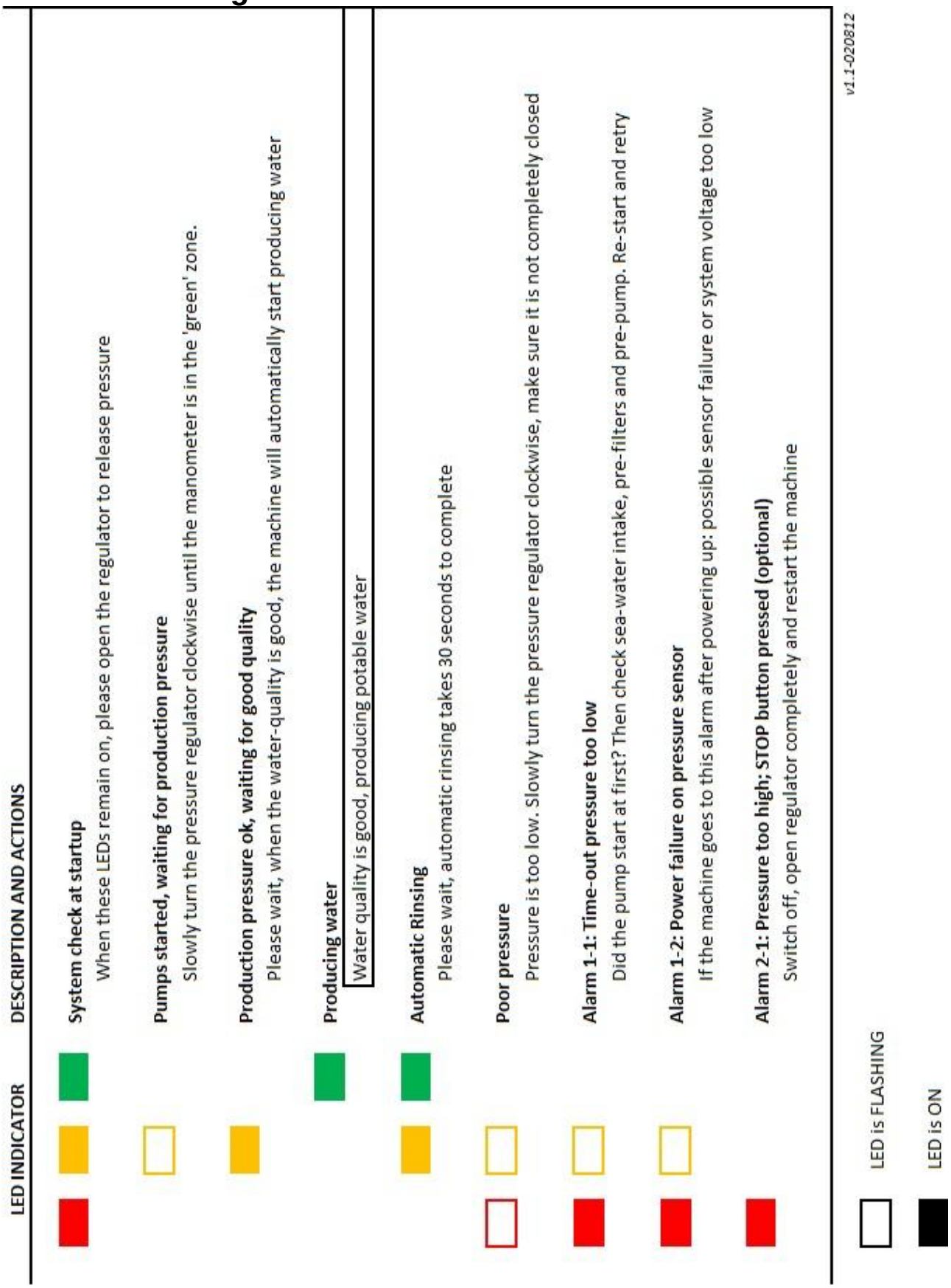
APPENDIX – A5

Troubleshooting

PROBLEM	CAUSE	SOLUTIONS
Leak on the pressure regulator in front of the control panel	Loosened regulation cable gland	Tighten the cable gland with a 12 wrench.
Noisy HP pump.	- Reduced water inlet or air inlet in the system. - Leak on pump head seals.	- Ensure correct size of hoses (diameter), clips and filters secure and filters clean. - Replace seals.
Oil leak on HP pump	Worn seals on connecting rods	- Replace the seals.
Insufficient water flow	- Very cold water - Dirty pre filter - Tension drop on the power cable	- Replace the pre filter - Recharge batteries - Check the connection. - Inadequate power cable section, reinforce cable section.
Water leak under the HP head	- Worn seals	- Replace plunger seals
No pressure reading	Insufficient water	Open the hull valve and / or the rinsing valve
Pressure doesn’t come up.	Dirty pump valves	Dismantle and clean the valves in the pump head

APPENDIX – A5

Troubleshooting: led indicator



USER'S MANUAL
DUO60® installation and utilisation

DESSALATOR

Technical and Sales Departments :
Z.I des 3 Moulins – « Euro 92 » – Bât. D – rue des Cistes – 06600 ANTIBES
FRANCE

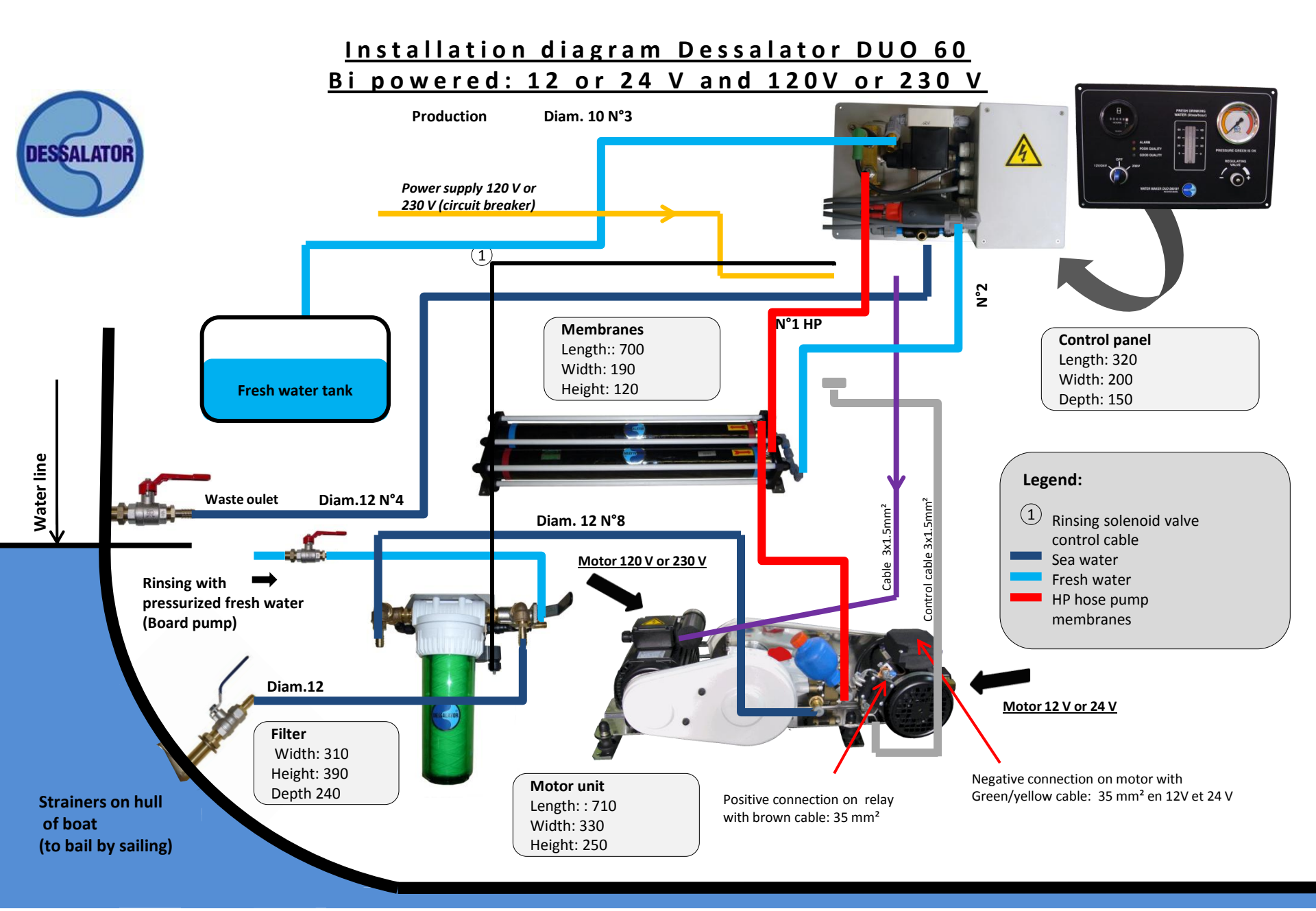
Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
e-mail: contact@dessalator.com
Web site: www.dessalator.com

Version A3

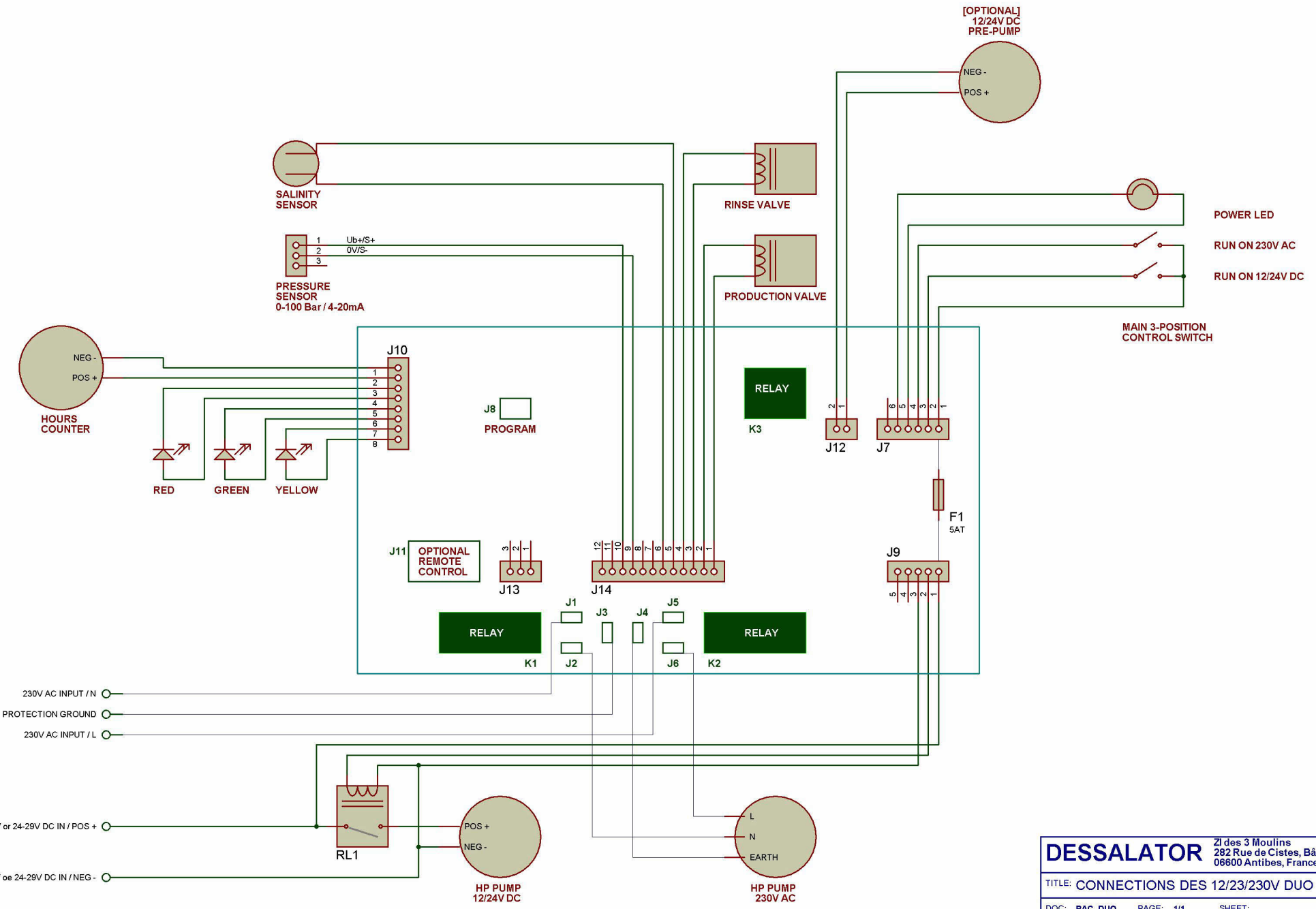
CONTENTS

Appendix:

Installation diagram Dessalator DUO 60
Bi powered: 12 or 24 V and 120V or 230 V



DESSALATOR, Z.I. des 3 Moulins-282, rue des Cistes- Bât. « Euro 92 » D, F 06600 Antibes .
Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 E-mail: contact@dessalator.com



DESSALATOR

ZI des 3 Moulins
282 Rue de Cistes, Bâtiment Euro 92
06600 Antibes, France

TITLE: CONNECTIONS DES 12/23/230V DUO

DOC:	RAC_DUO	PAGE:	1/1	SHEET:	
REV:	A	DATE:	04/12/10	AUTHOR:	VAK

GREENTRONICS BV - THE NETHERLANDS

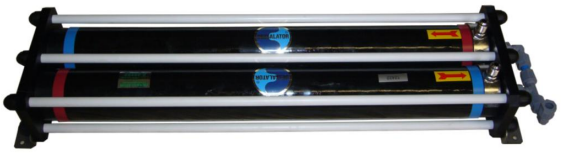
1. Components supplied with the Dessalator®:

Version A3

Hull valve:
It must be located the lowest possible in the boat, to the back for a motor yacht or in the centre near the keel for a sailing boat.
The hull valve strainer filters out the larger particles at system entrance.

Pre-filter:
It must be located the nearest possible to the hull valve and be compulsory under the waterline. If not possible, there is a solution: Install a LP pump (optional).
The pre-filter filters out solid particles down to 5 µm at the motor unit inlet. It is supplied with wrench. For automatic rinsing an electro valve is mounted.
The pre-filter filters out solid particles down to 5 µm at the motor unit inlet. It is supplied with wrench. For automatic rinsing an electro-valve is mounted on the pre filter.

Motor unit:
It must be located compulsory under the waterline
The motor unit is comprised of the 12 or 24 V motor and the 120 or 230 V motor. **It should be installed in a well-ventilated space**. **BEWARE**: In **120V**, please think of an even **more important ventilation of the motor unit** than in 230V.



Membrane unit:
The membrane unit includes 2 membranes 2521 assembled in a compact frame.

According to the model, a fuse or a circuit breaker is supplied.

Control panel:
includes a HP gauge, a flowmeter, an on/off switch, a pressure adjustment knob, an operating time meter, 3 indicator lights.

Pipes and hoses supplied by Dessalator®:

- High pressure pipes pump/membranes and membranes/control panel (2 pipes and 4 special connectors)
- Water production pipe membrane / control panel.

Additional hardware needed for assembly:

- Miscellaneous screws (including Parker)
- Stainless jubilee clips ∅ 10mm and ∅12mm
- Assortment of plastic rings (tie wraps)
- Teflon tape or insulating water proof tape
- Silicon Rubson mastic, Sicaflex or equivalent
- Ribbed insulating pipe for cables and HP tubes
- Tricoflex hoses ∅ 10mm and ∅ 12mm
- Power cable: 35mm² for the 12V and 20mm² for the 24V
- Various tools (electric drill, saw, …)

2. How to install the watermaker:

2.1 Sea water inlet

Sea water inlet valve:

The strainer should be positioned as low as possible below the waterline and as far as possible from the deck waste oulet. Drill the hull ∅ 21mm. The grooves on the strainer should be facing forward (towards the bow) for maximum water intake when the boat is moving forward. Please seal watertight with Rubson mastic or Sicaflex and ensure that the immersed part is painted with underwater grade paint.
The hull valve should be accessible for maintenance. Make the valve / strainer and valve / hose connector watertight using 577 Loctite or Teflon tape.

Cartridge pre-filter:

The pre-filter should also be positioned as low as possible below the waterline and it should remain accessible. The mounting bracket is reversible, which facilitates the height positioning. The hose connection must be done with 12mm inner diameter Tricoflex for all the sea water circuit and the pressurized rinsing. Don't forget to place two stainless steel collars on each connection. 5cm space should be left below the filter body to allow the filter basin to be removed. A wrench is supplied to dismantle the filter. The fresh water pressurized rinsing must be connected to the output of your board pump. An electro-valve is mounted on the output (diam. 12) for automatic rinsing. It can be connected under a sink, a wash basin or on the way of pressurized cold water hoses. The valve handle must be positioned to the front when the water maker is working. For a manual rinsing, please move the valve handle to the back. When replacing the filter cartridge, please check that the O-ring seal for the basin is secure and that the bleeder screw is tightened and fill the circuit with fresh water without pressure again for 3 to 4 minutes, put then the handle to the front.

Connections:

Hull valve / three-way valve, Pre-filter / pump, Fresh water / three-way valve, rinsing electro valve
The sea water inlet valve should be connected to the pre-filter using a tricoflex hose of inner ∅ 12mm, for sea water circuit and rinsing under pressure. Mount two jubilee clips at each joint, with their tightening heads positioned diametrically opposite on the hose. Connect the pressurized fresh water from the water oulet to the three-way valve. This connection can be made under a sink, wash basin or anywhere on the length of the pressurized fresh water pipe. When operating in sea water mode, the valve handle should be positioned in line with the filter (see photo above).

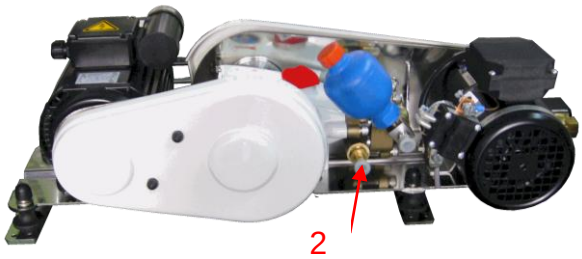
Recommendation:

If the pipe must pass through dividing walls or touch sharp edges, use an insulating pipe or tube superior to the pipe diameter to protect it against wear and friction.

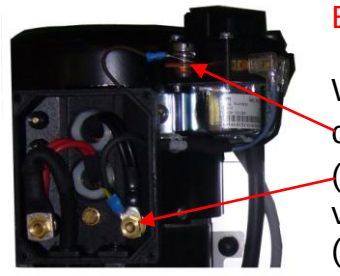
2. How to install the DUO60:

2.2 Motor unit:

The HP motor unit should be installed as low as possible in the boat in a horizontal position and it must be protected from water spray as much as possible. The unit is mounted using two brackets under the two motors leaving a few centimetres clear space around the unit, to get sufficient air circulation space for motor cooling. The connection between the prefilter[1] oulet and the inlet to the low pressure side of the pump[2] is in Tricoflex hose of ∅ 12mm with doubled stainless jubilee clips at each joint.
The HP head of the pump is connected to the membrane inlet (red mark) through an HP pipe, cut to the appropriate length (see installation of connectors appendix A2).
Apply a little liquid Loctite or nut seal on the male and female cones before joining.

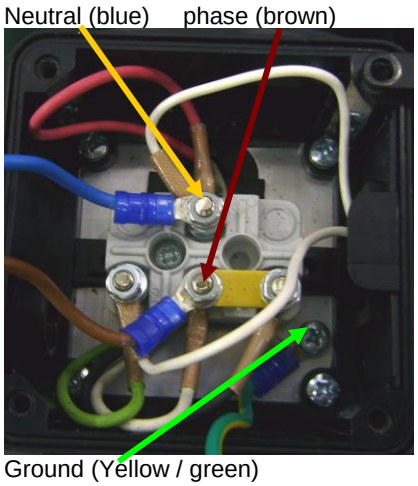


2.3 Electrical connections:



CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

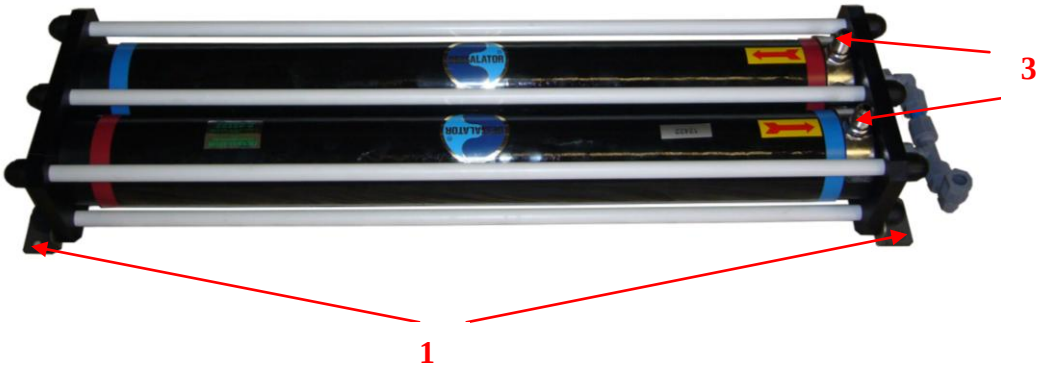
When connecting the 12 or 24V motor ensure that the polarity is correct: positive (brown wire[3]) on the relay and negative (green/yellow wire[4]) on the 12 or 24V motor. Depending on the voltage install a 12V fuse holder (supplied) or a 24V circuit breaker (supplied) on the positive cable. Ensure that the cable is of sufficient diameter: 35mm² for the 12V or 20mm² for the 24V.

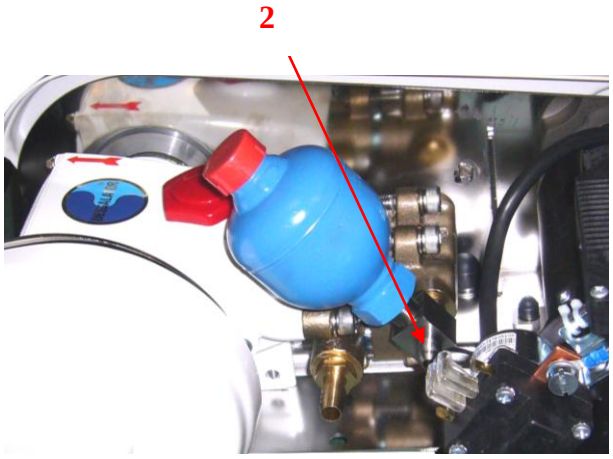


The Dessalator control cable is 5m long and is equipped with a plug with a pin locator system. The Dessalator® can only be operated when the power cable is connected to a DC supply.
The 120 or 230 V motor is connected using the cable from the control panel, taking care to respect the connections on the terminal strip.

2. How to install the desalinator:

2.4 Membrane unit



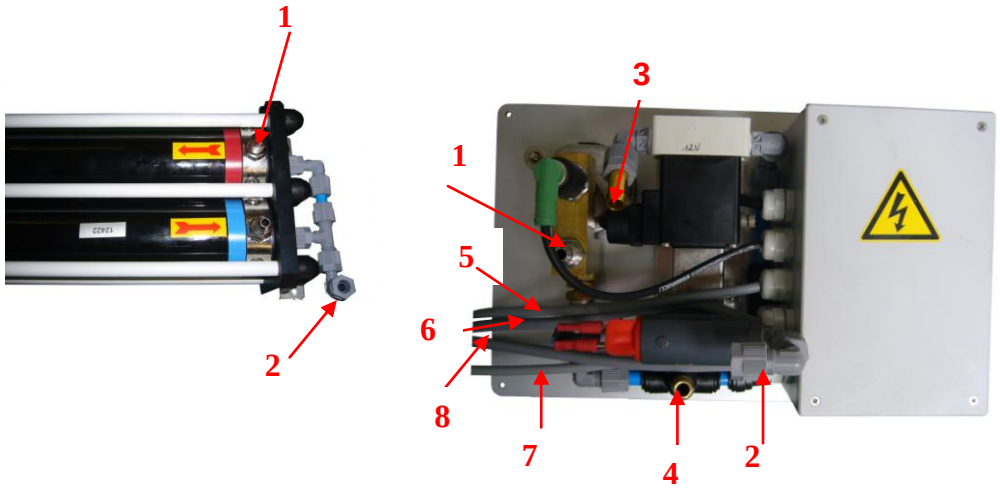


The membranes can be installed horizontally, preferably flat or on a wall support. They are mounted using 8 Parker screws in *stainless steel brackets*[1]. As the hose from the HP pump[2] vibrates, it is preferable to install the hose with an insulating tube. The HP connectors should be installed strictly in accordance with the instructions (Appendix A2). Apply a little loctite or nut seal to the two male and female cones before tightening.

Recommendation: To facilitate the connection[3], it is possible to rotate the heads through 90° by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Remove the rod to obtain access and rotate the membrane head using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the assembly.

2. How to install the desalinator:

2.5 Control panel:



The control panel must be mounted on a vertical surface as close as possible to the motor / pump unit and to the membranes. Leave space behind the panel to facilitate the connections. It is recommended that it is installed at the bottom or on the sides of cupboards, under chart table or main cabin seats, on the front panel of a rear bunk…

The panel has the following water connections:

- HP pipe exiting hose[1]
- Production hose exiting the membranes (blue hose)[2]
- Production hose from panel to tanks[3]: a 10mm inner ∅ Tricoflex hose will be required which must be connected either to the fresh water tanks or to the distribution manifold on the fresh water unit inlet provided there is no constricting valve on the fresh water tank outlet.
- A Tricoflex waste oulet inner ∅ 12mm hose[4] will also be required which can be connected to a sink, wash basin or cockpit water drain, to avoid having the hull redrilled. If this is not possible, remember to open the outlet valves before using the Dessalator.

Electrical connection:

- The 12 or 24V motor power cable[5] with a connector[5] and pin location system is connected to the cable exiting the 12 or 24V motor.
- The 5m long power cable 120 or 230V (information on the cable) has to be connected from the control panel to the 230V boat electric panel. The supplied circuit breaker must be installed on this cable, unless you already have one available on your electrical 120 or 230 V panel (Beware: min. 6 amps).
- The second 5m long 120 or 230V cable must be connected to the 120 or 230V motor electrical box (see diagram enclosed)
- The connection of the solenoid valve has to be done with cable[6].

3. Starting the DUO:

1. Ensure the valves are open before starting up the desalinator (Hull valve and waste oulet valve if relevant)

2. **To be done compulsory:**
   For the first use, after the replacement of the filter, when lifting the boat out of the water or for a long period of not using your water maker, please fill the circuit with fresh water: put the handle valve on the pre filter to the back; this operation should be done for 3 or 4 minutes, water maker stopped and pressure captor open (fully anti-clockwise). Once the circuit is full of fresh water put the valve handle of the pre filter to the front.

3. It is important to take account of the ampere capacity of the batteries and of the working duration: for a use without any risk, it is better to start the motor of the boat.

4. To start the water maker, the pressure regulator must be open. Switch on.

5. Turn the pressure regulator dial to the right until the HP gauge reading is in the orange zone then gradually adjust until the needle reaches the beginning of the green zone. Check that the pressure remains constant. The purpose of this operation is to remove air from the system and to obtain a more constant pressure while the water maker is running.

6. Fresh water quality and flow into the tank is automatically monitored by the electronics board.

7. If pressure becomes too high the water maker will cut out and the red indicator will light up. If this occurs, reduce pressure, switch off and restart the water maker.

8. To shut down the water maker: switch off then reduce pressure.

9. To shut down with rinsing, please see page 8 and 9.

If the water maker is not used for extended periods of time it should be rinsed preferably once a month. If not, the membranes will have to be sterilized for the storage (for 6 months).

Note: Fresh water production depends on the temperature of the sea water and on the cleanness of the 5µm pre-filter.

4. Directions for use:

MEMBRANES DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of the system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the desalinator is achieved with a sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water and of the sailing area. Output drops by approximately 2.5% to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C. Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid either sea water before treatment, fresh water provisionally stored or sterilizing liquid if the desalinator is not used for extended periods of time (See sterilization methods appendix A3). Sterilizer is effective for six months and must be replaced after this period of time.

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the desalinator in Marinas. **The system is not recommended for use in muddy or polluted water (briny water, river, Red Sea), which can clog the pre-filter and damage the membranes.** However, if the desalinator has to be used in such conditions only run it for very short periods, as soon as clean sea water becomes available rinse the membrane and run the system without pressure for 30 minutes with the pressure regulator open.

5. Maintenance:

CAUTION: IN FREEZING CONDITIONS, PLEASE EMPTY THE FLOWMETER TUBE ON THE CONTROL PANEL BY DISCONNECTING THE PRODUCTION HOSE AND BLOWING OR INJECTING AIR INTO THE HOSE, PROTECT YOUR MEMBRANES WITH BLANKETS.

5.1. Maintaining the membrane

After 1,000 working hours, it is normal that the flow lowers between 10 and 15%. If more, you should think of replacing the membranes.

- The volume of production of your watermaker can be made over the first 24 to 48 hours of operation. If the drinking water produced falls below the normal working specifications (sea water containing a TDS of 35,000 ppm, a sea water temperature of 25°C, and pressure of 65 bars), and if production is not improved by rinsing the membrane, then the membrane has to be replaced.

- Please take into consideration that the volume of drinking water produced is dependent on ideal sea water temperature and on pressure in the system. Therefore, if the volume of drinking water produced falls it does not necessarily mean that the membrane need to be replaced.

5.2. Rinsing the membranes

Once a week, the watermaker needs to be flushed with fresh water before using it to make fresh water. There is no need to flush it with fresh water after each use, as this is just a waste of water that are taken from the boat's tank.

There are 2 methods to flush the system: manual and automatic.
Both systems are using the water that are in the tanks of the boat, and there is no use in water from the dock or a connection of any hose from a source outside the boat.

Remember: <u>The biggest enemy of the membranes is fresh water.</u>

Fresh water should be always used with no pressure when going through the system (pressure dial turned all the way anti clockwise) and the system should always run with no pressure after a fresh water flush to dump all the fresh water that are in it, before making freshwater from sea water (also with the pressure dial all the way anti clockwise).
When running the watermaker with the dial all the way anti clockwise, it will shut it self down automatically after 1 minute. Only then, the watermaker is ready for use.

5. Maintenance:

Manual Flush

Next to the pre filter there is a valve. The valve is connected to the fresh water system of the boat and turning it, will automatically start the boat's water pump and a flow of fresh water from the tank to the watremaker.

1. **Don't turn the watermaker ON**. Leave it on it's OFF position.
2. Turn the pressure dial all the way anti clockwise.
3. Turn the valve of the fresh water intake, which is located next to the filter, for 2 minutes. The boat's water pump will start and fresh water will run through the watermaker.

Automatic Flush

After using the watermaker, don't switch it off.

While the watermaker is still running, turn the pressure dial all the way anti clockwise. The watermaker will stop making water and will automatically start the flushing process. The green and orange lights on the control panel will turn on, which indicates that flushing is in process. This should take 30 seconds and will stop automatically. The green and orange lights will shut off and the only indicator will be the blue flashing light on the ON/OFF button, to remind you to shut the watermaker OFF.

The automatic flush is a better way to flush the system since it's not only flushes the sea water out, it also back wash the pre-filter and dumps all the dirt and debris that accumulated in the filter's housing, back to the sea, through the sea water intake.

DON'T FORGET!!!

After each system flushing, before using the watermaker you need to:

1. Make sure the pressure dial is turned all the way anti clcockwise.
2. Turn the watermaker ON and let it run with no pressure for 1 minute until the red alarm light comes on. This is the time needed for the sea water to replace all the fresh water that are in the system, before running pressurized sea water through the membranes.

RUNNING FRESH WATER IN HIGH PRESSURE THROUGH THE MEMBRANES WILL DAMAGE THE MEMBRANES!!!

5. Maintenance:

5.3. STERILIZING THE MEMBRANE

When should the membrane be sterilized?

Normally, regular monthly rinsing of the membrane may be all that is required to maintain the membrane. If this is not possible, sterilization will be necessary. A sterilisation procedure should be carried out every six months.

Membrane sterilizing procedure:

1. Manual method: Thoroughly rinse the desalinator with fresh water for 10 minutes, using the three-way valve on the pre-filter. This procedure should be followed while the machine is idle. Pour the sterilizer (entire packet contents) into a bucket containing 8 litres of water. Disconnect the sea water inlet hose and immerse it in the bucket. Run the desalinator without increasing pressure until the bucket is empty. When the bucket is empty and the procedure is completed, the hose can be reconnected. If not, see number 3.

2. The sterilizing procedure can also be carried out using a garden spray: Pour the entire packet contents of sterilizer into a bucket containing 8 litres of fresh water and mix thoroughly. Fill the spray bottle with this mixture and spray the sterilizer into the watermaker inlet, at a spray pressure of 3 to 4 bars. If not, see number 3.

3. Sterilizing cartridge ST2:
   We have developed a sterilizing cartridge which makes this procedure very simple and easy. Cartridge instructions are given in appendix A3. Before using the desalinator again simply rinse with fresh water for a few minutes using the three-way valve on the pre-filter and all traces of the sterilizer will be removed.

5.4. HP Pump

The HP pump is half filled with oil to the indicated level on the gauge. Normally no additional oil is needed throughout the life of the watermaker. However, if refilling is necessary, use multi grade oil 15W40 and do not exceed the indicated level (in the middle of the red mark on the gauge which is on the back of the pump to the opposite of the pump head).

BEWARE: the sticker located on the red oil filling cap of the HP pump is there only for the shipment: it must be removed before use.

6. SPARE PARTS AND ACCESSORIES

Spare parts

Dessalator® systems are very reliable, hardwaring and do not generally require expensive services. Nevertheless an accident is always possible (running without enough water, accidental overpressure, impact, …).

Should the need arises we supply spare parts and maintenance accessories:

- 5µm 10 ft filter
- driving belts
- motor relays
- production solenoid valve
- HP pump seals and valves
- HP hose (sold by meter)
- Connector for HP tube
- Flowmeter tube

Accessories:

- Sterilizing cartridge ST2
- Sterilizer bag
- Mineralizing cartridge

APPENDIX – A1

REVERSE OSMOSIS

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membrane. This waste, along with the remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids); approximately 2% of the 35,000 PPM/TDS will pass through the membrane. This guarantees drinking water with a TDS value of 500 (average). Please note that the drinking water produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with a small dose of chlorine or iodine and it should be also mineralized to ensure it remains consumable. Pay attention not to allow pure chlorine (or a too high dose of chlorine) into the desalination system, as this could damage the device.

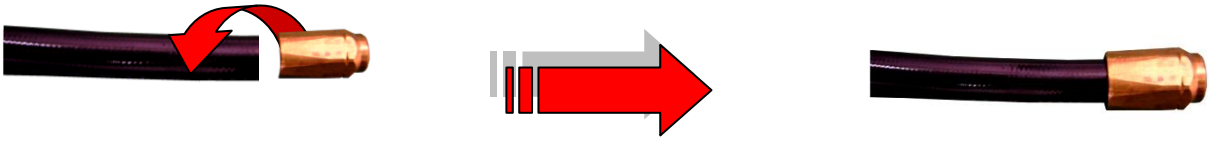
How does your desalinator work?

Sea water enters the inlet valve which penetrates the hull. This sea water is then routed through the 5 µm pre-filter. The filtered water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurised water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: If the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity > 1,000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel. The production capacity of fresh water is achieved with a sea water temperature of 25°C. The output drops by approximately 2,5 to 5% for each degree below 25°C.

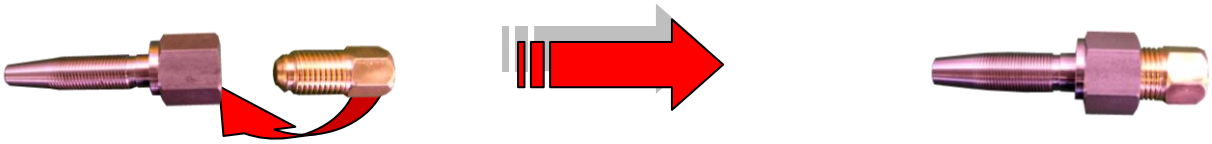
APPENDIX – A2

Installation instructions – HP Connectors DESSALATOR

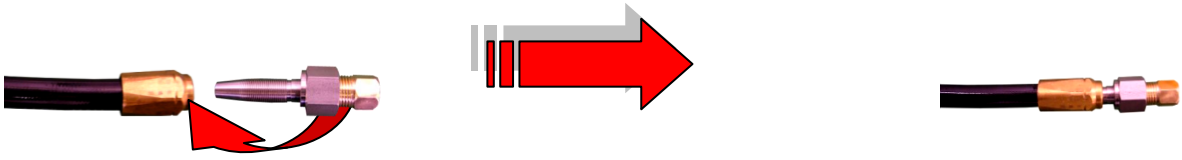
1. Screw the brass union (skirt) anti-clockwise onto the HP pipe, no more than 2.5cm. Stop where the inner threading disappears.



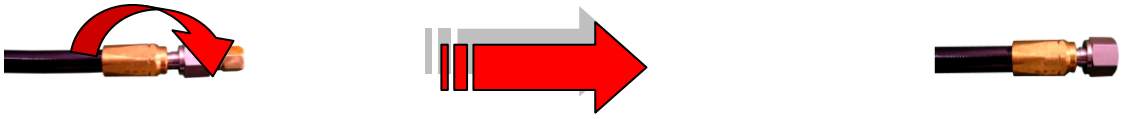
2. Insert the steel tapered end-piece into the stainless steel nut, and tighten very firmly on the male tapered union.



3. Lightly grease the tip of the stainless steel cone and screw it straight into the brass union. Stop where the steel threading disappears into the brass end-piece (a gap of approximately 7mm between the nut and the brass union)



4. Unscrew the nut of the tapered adaptor. The connector is now ready for the hose from pump to membrane. We recommend using an insulating pipe to protect it against vibrations.



5. IMPORTANT: Check carefully that the end-piece does not block the hose:

- Please don't forget to put Loctite or watertight product on the male and female cones when remounting.
- Please check that the HP connector is not blocked up.
  - ➢ either by blowing into the hose
  - ➢ or by inserting a screwdriver to check free passage.

APPENDIX – A3

Sterilizing cartridge – instructions for use

The desalinator is not running:

1. Close the sea water inlet valve.
2. Open the sterilizing cartridge
3. Remove the top grid
4. Place the foam filter at the bottom of the filter
5. Pour the powder into the cartridge
6. Replace the top grid and close the cartridge
7. Check that the seal is properly positioned.
8. Dismantle the basin of the pre filter
9. Remove the 5µm cartridge from the pre-filter.

Remove the 5µm cartridge from the pre-filter

10. Replace with the sterilizing cartridge ST2

Replace the 5µm cartridge with the sterilizing cartridge ST2

11. Set the rinsing valve to pressurized fresh water and rinse, leaving a little sterilizer in the filter.
12. At this point, the desalinator must be switched off
13. The sterilisation remains effective for six months at most. (Repeat after this time as necessary).

Caution: Before next use, rinse the desalinator thoroughly with fresh water for 15 minutes and ensure that the sterilizing cartridge has been removed and replaced by a 5 µm cartridge.

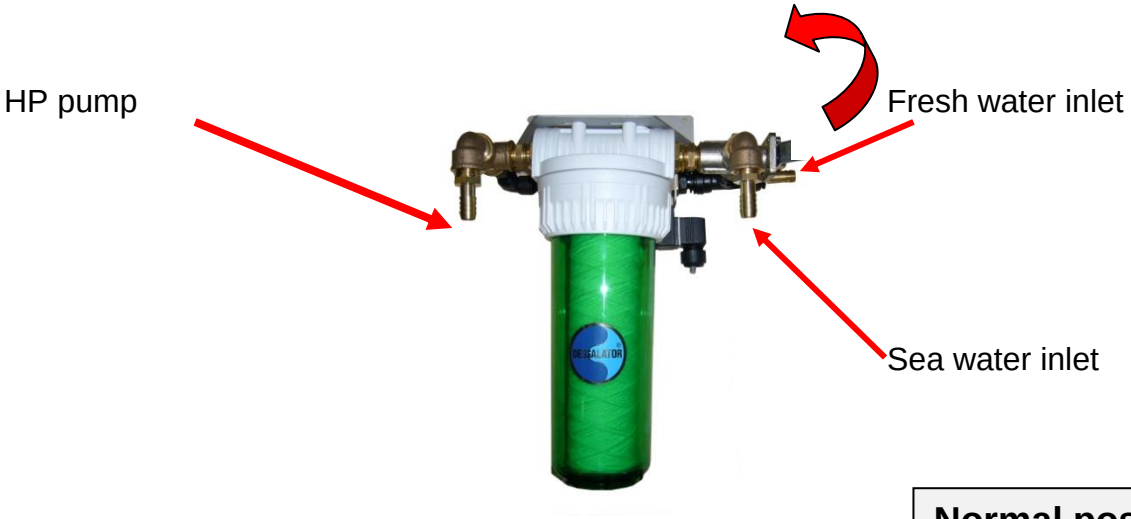
BEWARE: The ST2 cartridge is reusable.

APPENDIX – A4

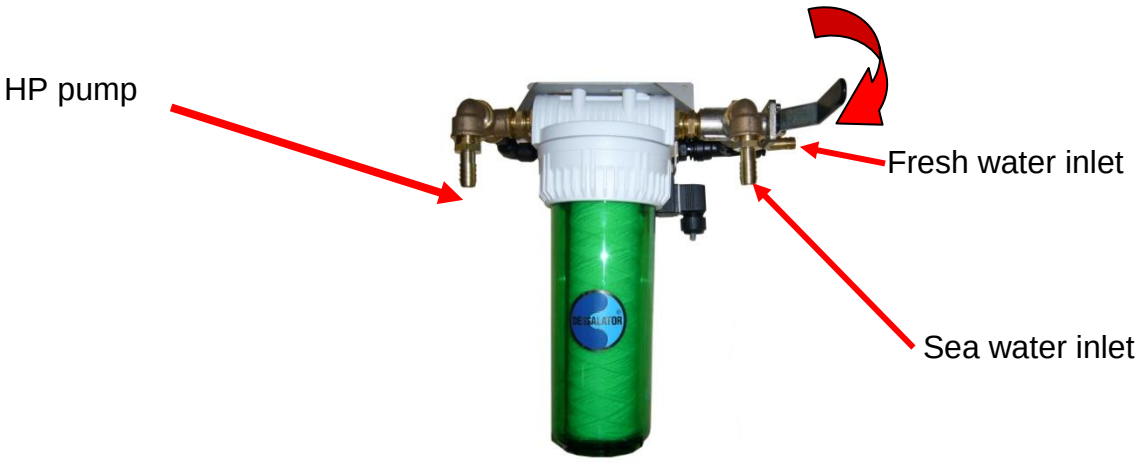
MANUAL RINSING

Your Dessalator® is equipped with an automated rinsing.
Here below the procedure to rinse manually.

Manual rinsing and sterilization:
Valve handle to the back.



Normal position for a use with sea water:
Valve handle to the front



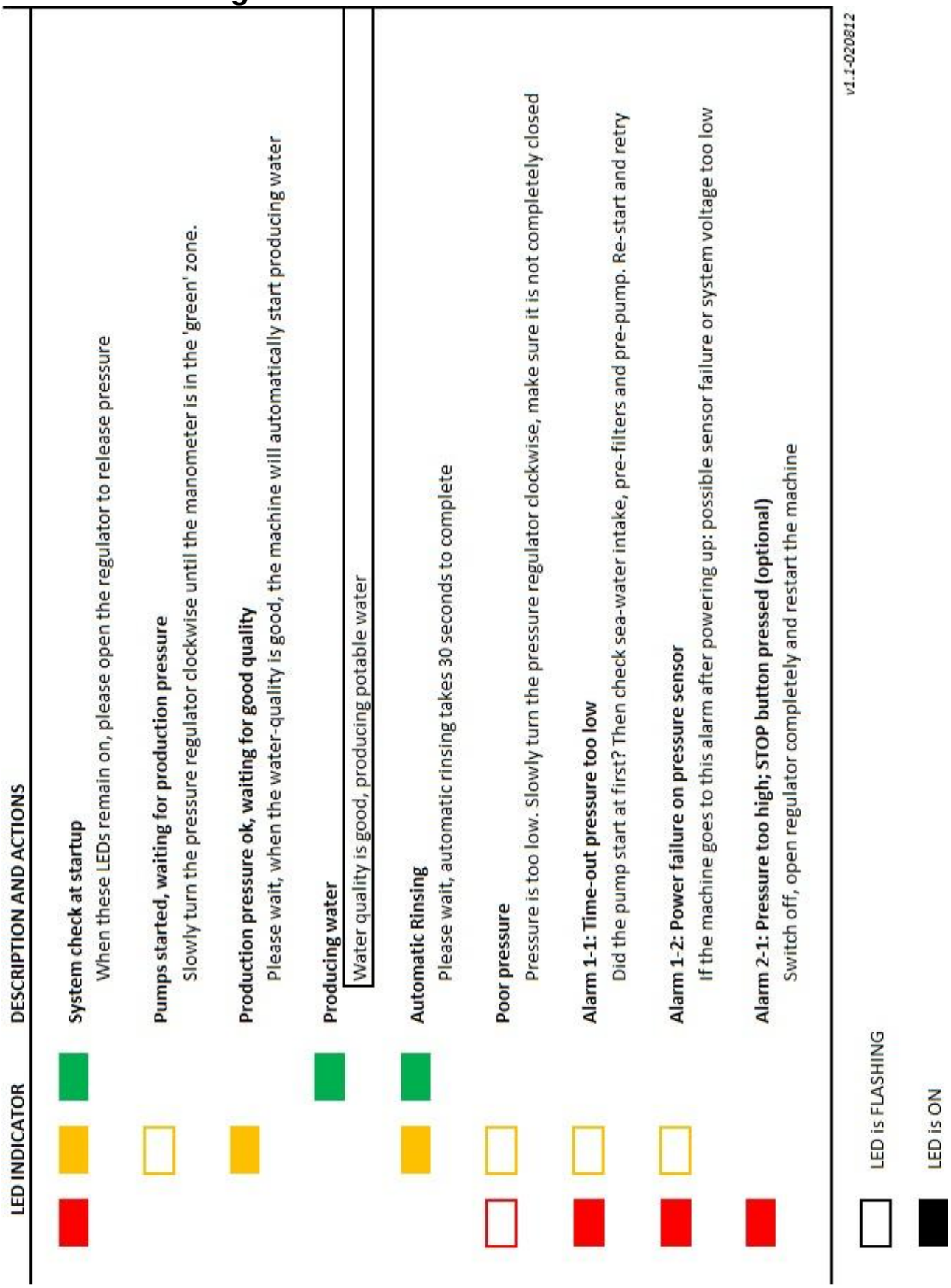
APPENDIX – A5

Troubleshooting

PROBLEM	CAUSE	SOLUTIONS
Leak on the pressure regulator in front of the control panel	Loosened regulation cable gland	Tighten the cable gland with a 12 wrench.
Noisy HP pump.	- Reduced water inlet or air inlet in the system. - Leak on pump head seals.	- Ensure correct size of hoses (diameter), clips and filters secure and filters clean. - Replace seals.
Oil leak on HP pump	Worn seals on connecting rods	- Replace the seals.
Insufficient water flow	- Very cold water - Dirty pre filter - Tension drop on the power cable	- Replace the pre filter - Recharge batteries - Check the connection. - Inadequate power cable section, reinforce cable section.
Water leak under the HP head	- Worn seals	- Replace plunger seals
No pressure reading	Insufficient water	Open the hull valve and / or the rinsing valve
Pressure doesn't come up.	Dirty pump valves	Dismantle and clean the valves in the pump head

APPENDIX – A5

Troubleshooting: led indicator



USER'S MANUAL
DESSALATOR® SOLO 100 LITRES / HOUR

DESSALATOR®

Technical and Sales Departments :
Z.I des 3 Moulins – "Euro 92 – Bât. D – rue des Cistes – 06600 ANTIBES
FRANCE

Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
e-mail: contact@dessalator.com
Web site: www.dessalator.com

Version A4

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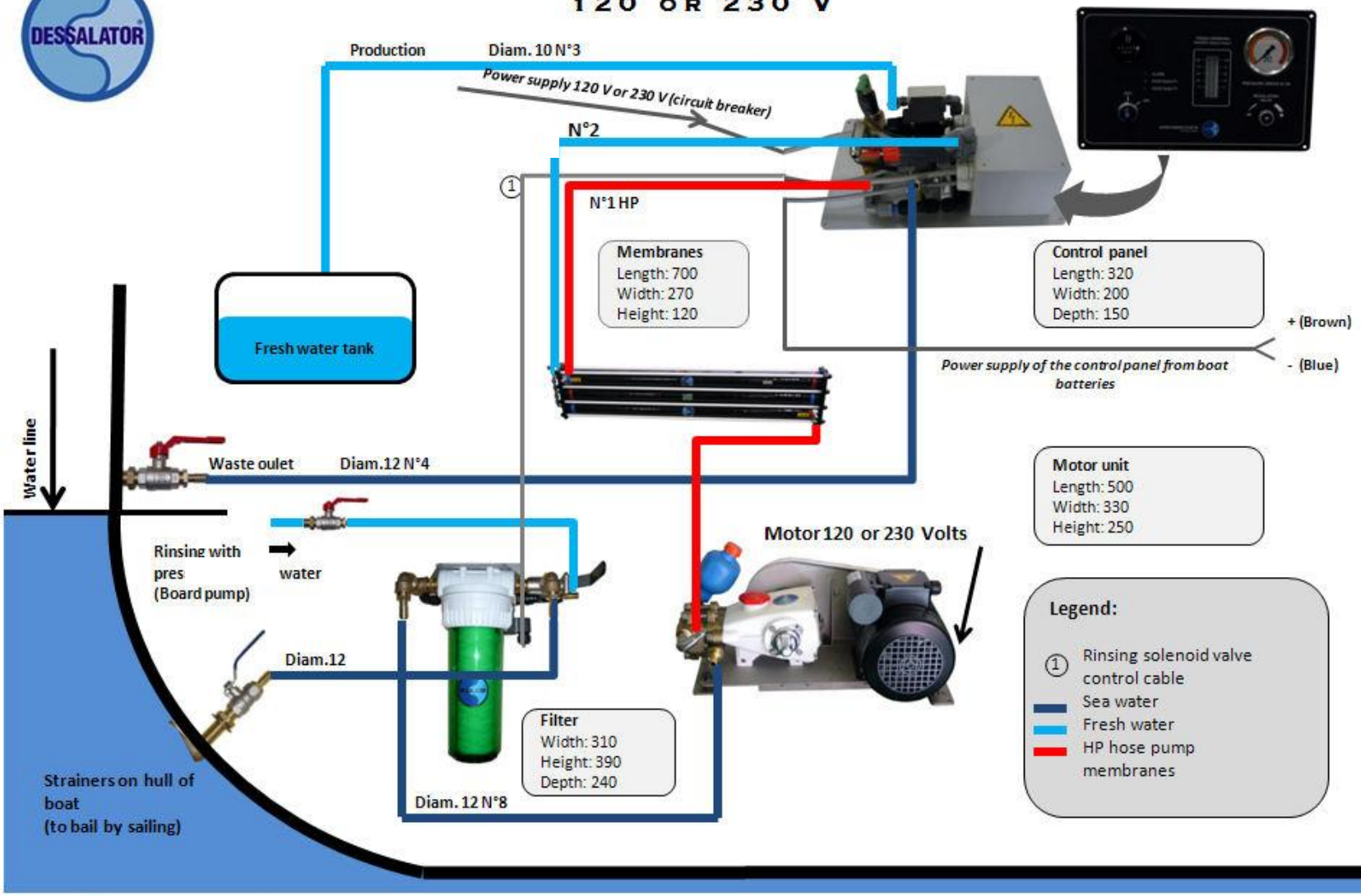
Appendix:

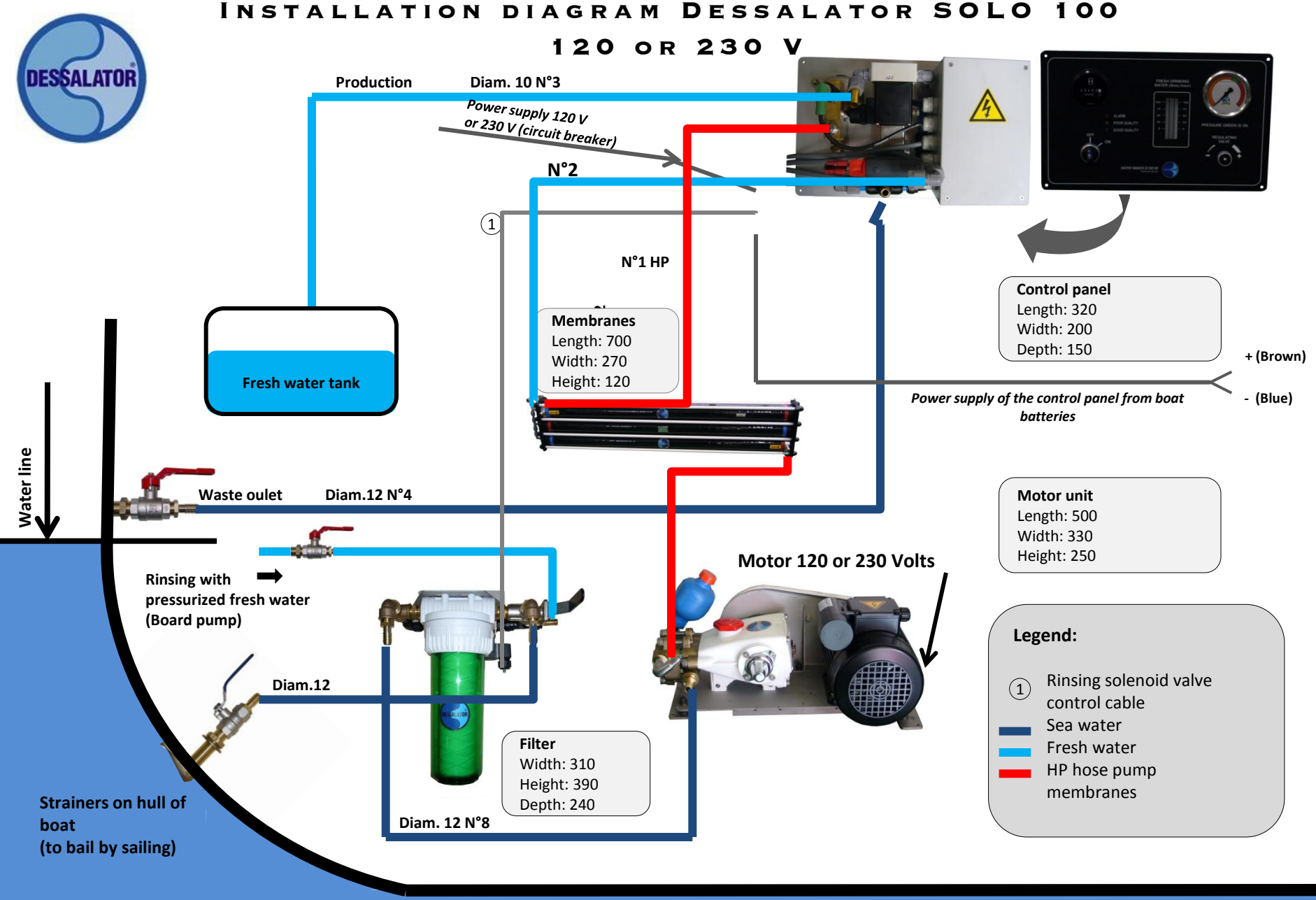
Connection plan DES 12/24/230V April 12, 2006 Rev B

INSTALLATION DIAGRAM DESSALATOR SOLO 100
120 OR 230 V

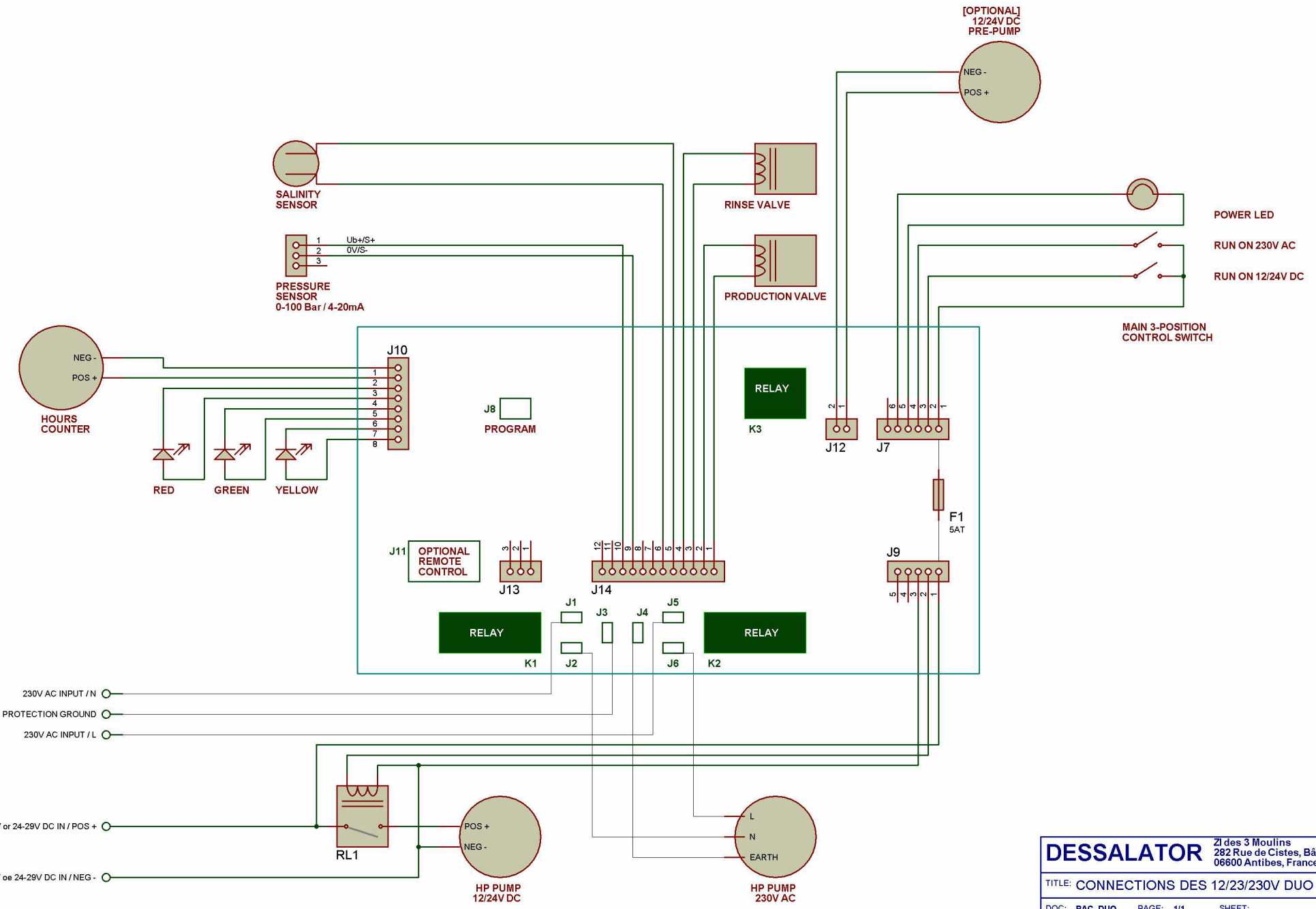


DESSALATOR, Z.I. des 3 Moulins-282, rue des Cistes Bât« Euro 92 ». D, 06600 Antibes .
Tél: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 e-mail: contact@dessalator.com

Installation diagram Dessalator SOLO 100
120 or 230 V



DESSALATOR, Z.I. des 3 Moulins-282, rue des Cistes Bât« Euro 92 ». D, 06600 Antibes .
Tél: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 e-mail: contact@dessalator.com



DESSALATOR

ZI des 3 Moulins
282 Rue de Cistes, Bâtiment Euro 92
06600 Antibes, France

TITLE: CONNECTIONS DES 12/23/230V DUO

DOC:	RAC_DUO	PAGE:	1/1	SHEET:	
REV:	A	DATE:	04/12/10	AUTHOR:	VAK

GREENTRONICS BV - THE NETHERLANDS

1. Components supplied with the Dessalator®:

Version A4

Hull valve:
It must be located the lowest possible in the boat, to the back for a motor yacht or in the centre near the keel for a sailing boat.
The hull valve strainer filters out the larger particles at system entrance.

Pre-filter:
It must be located the nearest possible to the hull valve and be compulsory under the waterline. If not possible, there is a solution: Install a LP pump (optional).
The pre-filter filters out solid particles down to 5 µm at the motor unit inlet. It is supplied with wrench. For automatic rinsing an electro valve is mounted.

Motor-Pump unit:
It must be located compulsory under the waterline.
The motor-pump unit is comprised of the 120 or 230 V motor and a high pressure pump. **It should be installed in a well-ventilated space**. **BEWARE**: In **120V**, please think of an even **more important ventilation of the motor unit** than in 230V.

Membrane unit:
The membrane unit includes 3 membranes 2521 assembled in a compact frame.

According to the model, a fuse or a circuit breaker is supplied.

Control panel:
includes a HP gauge, a flowmeter, an on/off switch, a pressure adjustment knob, an operating time meter, 3 indicator lights and a control in 12 or 24 V for security.

Pipes and hoses supplied by Dessalator®:

- High pressure pipes pump/membranes and membranes/control panel (2 pipes and 4 special connectors)
- Water production pipe membrane / control panel.

Additional hardware needed for assembly:

- Miscellaneous screws (including Parker)
- Stainless jubilee clips ∅ 10 and ∅12
- Assortment of plastic rings (tie wraps)
- Teflon tape or insulating water proof tape
- Silicon Rubson mastic, Sicaflex or equivalent
- Ribbed insulating pipe for cables and HP tubes
- Tricoflex hoses ∅ 10 and ∅ 12
- Power cable: 35mm² for the 12V and 20mm² for the 24V
- Various tools (electric drill, saw, …)

2. How to install the watermaker:

2.1 Sea water inlet

Sea water inlet valve:

The strainer should be positioned as low as possible below the waterline and as far as possible from the deck waste oulet. Drill the hull ∅ 21mm. The grooves on the strainer should be facing forward (towards the bow) for maximum water intake when the boat is moving forward. Please seal watertight with Rubson mastic or Sicaflex and ensure that the immersed part is painted with underwater grade paint.
The hull valve should be accessible for maintenance. Make the valve / strainer and valve / hose connector watertight using 577 Loctite or Teflon tape.

Cartridge pre-filter:

The pre-filter should also be positioned as low as possible below the waterline and it should remain accessible. The mounting bracket is reversible, which facilitates the height positioning. The hose connection must be done with 12mm inner diameter Tricoflex for all the sea water circuit and the pressurized rinsing. Don't forget to place two stainless steel collars on each connection. 5cm space should be left below the filter body to allow the filter basin to be removed. A wrench is supplied to dismantle the filter. The fresh water pressurized rinsing must be connected to the output of your board pump. An electro-valve is mounted on the output (diam. 12) for automatic rinsing. It can be connected under a sink, a wash basin or on the way of pressurized cold water hoses. The valve handle must be positioned to the front when the water maker is working. For a manual rinsing, please move the valve handle to the back. When replacing the filter cartridge, please check that the O-ring seal for the basin is secure and that the bleeder screw is tightened and fill the circuit with fresh water again for 3 to 4 minutes, put then the handle to the front.

Connections:

Hull valve / three-way valve, Pre-filter / pump, Fresh water / three-way valve / rinsing electro valve
The sea water inlet valve should be connected to the pre-filter using a tricoflex hose of inner ∅ 12mm, for sea water circuit and rinsing under pressure. Mount two jubilee clips at each joint, with their tightening heads positioned diametrically opposite on the hose. Connect the pressurized fresh water from the water oulet to the three-way valve. This connection can be made under a sink, wash basin or anywhere on the length of the pressurized fresh water pipe. When operating in sea water mode, the valve handle should be positioned in line with the filter (see photo above).

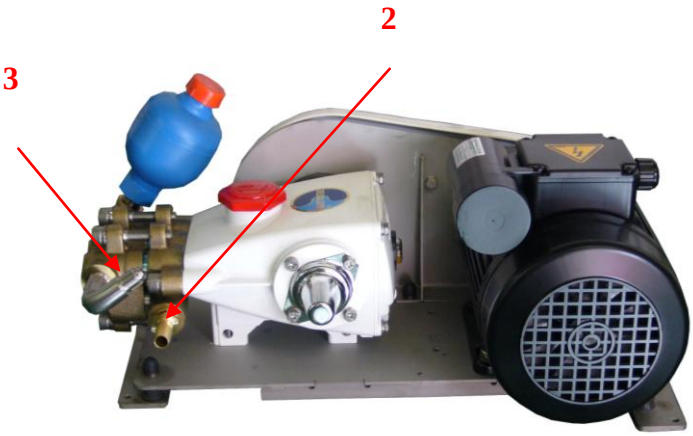
Recommendation:

If the pipe must pass through dividing walls or touch sharp edges, use an insulating pipe or tube superior to the pipe diameter to protect it against wear and friction.

2. How to install the desalinator:

2.2 Motor unit:

The HP motor unit should be installed as low as possible in the boat in a horizontal position and it must be protected from water spray as much as possible. The unit is mounted using two brackets under the two motors leaving a few centimetres clear space around the unit, to get sufficient air circulation space for motor cooling. The connection between the prefilter[1] oulet and the inlet to the low pressure side of the pump[2] is in Tricoflex hose of ∅ 12mm with doubled stainless jubilee clips at each joint.
The HP head of the pump is connected to the membrane inlet (red mark) through an HP pipe, cut to the appropriate length (see installation of connectors appendix A2).
Apply a little liquid Loctite or nut seal on the male and female cones before joining.



2.3 Electrical connections:

Neutral (blue) phase (brown)

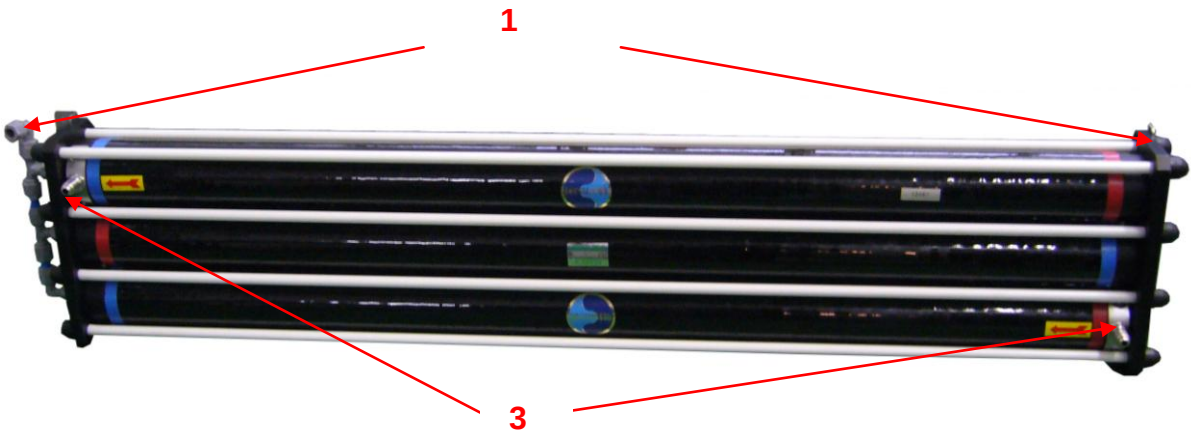
Earth (yellow / green)

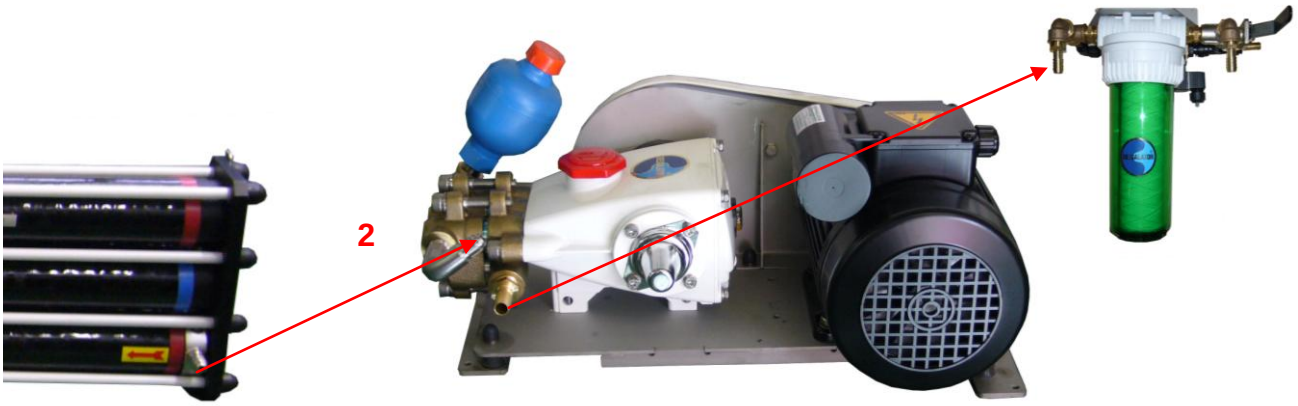
CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

Please connection the 120 or 230 V motor according to the installation diagram. Depending on the voltage, we supply an adequate circuit breaker.

2. How to install the desalinator:

2.4 Membrane unit



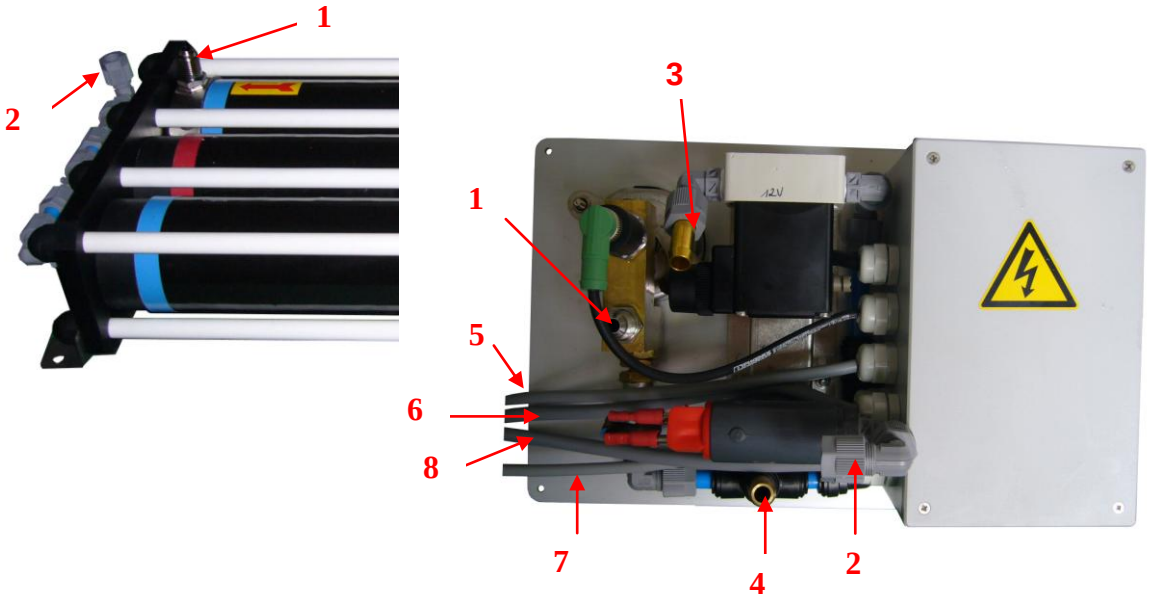


The membranes can be installed horizontally, preferably flat or on a wall support. They are mounted using 8 Parker screws in *stainless steel brackets*[1]. As the hose from the HP pump[2] vibrates, it is preferable to install the hose with an insulating tube. The HP connectors should be installed strictly in accordance with the instructions (Appendix A2). Apply a little loctite or nut seal to the two male and female cones before tightening.

Recommendation: To facilitate the connection[3], it is possible to rotate the heads through 90° by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Remove the rod to obtain access and rotate the membrane head using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the assembly.

2. How to install the desalinator:

2.5 Control panel:



The control panel must be mounted on a vertical surface as close as possible to the motor / pump unit and to the membranes. Leave space behind the panel to facilitate the connections. It is recommended that it is installed at the bottom or on the sides of cupboards, under chart table or main cabin seats, on the front panel of a rear bunk, …

The panel has the following water connections:

- HP hose[1]
- Production hose exiting the membranes (blue hose)[2]
- Production hose from panel to tanks[3]: a 10mm inner ∅ Tricoflex hose will be required which must be connected either to the fresh water tanks or to the distribution manifold on the fresh water unit inlet provided there is no constricting valve on the fresh water tank outlet.
- A Tricoflex waste oulet inner ∅ 12mm hose[4] will also be required which can be connected to a sink, wash basin or cockpit water drain, to avoid having the hull re-drilled. If this is not possible, remember to open the outlet valves before using the Dessalator.

Electrical connection:

- The cable[5] is for the solenoid valve connection, the cable[6] is connected to 120 or 230 volts, the cable[7] must be powered in 12 or 24 V on board network (brown:positive connection, blue: negative connection), the cable[8] is connected to the motor.

3. Starting the Dessalator®:

1. Ensure the valves are open before starting up the desalinator (Hull valve and waste oulet valve if relevant)

2. **To be done compulsory:**
   For the first use, after the replacement of the filter, when lifting the boat out of the water or for a long period of not using your water maker, please fill the circuit with fresh water: put the handle valve on the pre filter to the back; this operation should be done for 3 or 4 minutes, water maker stopped and pressure captor open (fully anti-clockwise). Once the circuit is full of fresh water put the valve handle of the pre filter to the front.

3. To start the water maker, the pressure regulator must be open. Switch on.

4. Turn the pressure regulator dial to the right until the HP gauge reading is in the orange zone then gradually adjust until the needle reaches the beginning of the green zone. Check that the pressure remains constant. The purpose of this operation is to remove air from the system and to obtain a more constant pressure while the water maker is running.

5. Fresh water quality and flow into the tank is automatically monitored by the electronics board.

6. If pressure becomes too high the water maker will cut out and the red indicator will light up. If this occurs, reduce pressure, switch off and restart the water maker.

7. To shut down the water maker: switch off then reduce pressure.

8. To shut down with rinsing, please see page 8 and 9.

9. If the water maker is not used for extended periods of time it should be rinsed preferably once a month. If not, the membranes will have to be sterilized for the storage (for 6 months).

Note: Fresh water production depends on the temperature of the sea water and on the cleanness of the 5µm pre-filter.

4. Directions for use:

MEMBRANES DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the desalinator is achieved with a sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water. Output drops by approximately 2.5% to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C. Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid either sea water before treatment, fresh water provisionally stored or sterilizing liquid if the desalinator is not used for extended periods of time (See sterilization methods appendix A3). Sterilizer is effective for six months and must be replaced after this period of time.

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the desalinator in Marinas. **The system is not recommended for use in muddy or polluted water (briny water, river, Red Sea), which can clog the pre-filter and damage the membranes**. However, if the desalinator has to be used in such conditions only run it for very short periods, as soon as clean sea water becomes available rinse the membrane and run the system without pressure for 30 minutes with the pressure regulator open.

5. Maintenance:

CAUTION: IN FREEZING CONDITIONS, PLEASE EMPTY THE FLOWMETER TUBE ON THE CONTROL PANEL BY DISCONNECTING THE PRODUCTION HOSE AND BLOWING OR INJECTING AIR INTO THE HOSE, PROTECT YOUR MEMBRANES WITH BLANKETS.

5.1. Maintaining the membrane

After 1,000 working hours, it is normal that the flow lowers between 10 and 15%. If more, you should think of replacing the membranes.

- The volume of production of your watermaker can be made over the first 24 to 48 hours of operation. If the drinking water produced falls below the normal working specifications (sea water containing a TDS of 35,000 ppm, a sea water temperature of 25°C, and pressure of 65 bars), and if production is not improved by rinsing the membrane, then the membrane has to be replaced.

- Please take into consideration that the volume of drinking water produced is dependent on ideal sea water temperature and on pressure in the system. Therefore, if the volume of drinking water produced falls it does not necessarily mean that the membrane need to be replaced.

5.2. Rinsing the membranes

Once a week, the watermaker needs to be flushed with fresh water before using it to make fresh water. There is no need to flush it with fresh water after each use, as this is just a waste of water that is taken from the boat's tank.

There are 2 methods to flush the system: manual and automatic.
Both systems are using the water that are in the tanks of the boat, and there is no use in water from the dock or a connection of any hose from a source outside the boat.

Remember: <u>The biggest enemy of the membranes is fresh water.</u>

Fresh water should be always used with no pressure when going through the system (pressure dial turned all the way anti clockwise) and the system should always run with no pressure after a fresh water flush to dump all the fresh water that are in it, before making freshwater from sea water (also with the pressure dial all the way anti clockwise).
When running the watermaker with the dial all the way anti clockwise, it will shut it self down automatically after 1 minute. Only then, the watermaker is ready for use.

5. Maintenance:

Manual Flush

Next to the pre filter there is a valve. The valve is connected to the fresh water system of the boat and turning it, will automatically start the boat's water pump and a flow of fresh water from the tank to the watermaker.

1. **Don't turn the watermaker ON**. Leave it on it's OFF position.
2. Turn the pressure dial all the way anti clockwise.
3. Turn the valve of the fresh water intake, which is located next to the filter, for 2 minutes. The boat's water pump will start and fresh water will run through the watermaker.

Automatic Flush

After using the watermaker, don't switch it off.

While the watermaker is still running, turn the pressure dial all the way anti clockwise. The watermaker will stop making water and will automatically start the flushing process. The green and orange lights on the control panel will turn on, which indicates that flushing is in process. This should take 30 seconds and will stop automatically. The green and orange lights will shut off and the only indicator will be the blue flashing light on the ON/OFF button, to remind you to shut the watermaker OFF.

The automatic flush is a better way to flush the system since it's not only flushes the sea water out, it also back wash the pre-filter and dumps all the dirt and debris that accumulated in the filter's housing, back to the sea, through the sea water intake.

DON'T FORGET!!!

After each system flushing, before using the watermaker you need to:

1. Make sure the pressure dial is turned all the way anti clockwise.
2. Turn the watermaker ON and let it run with no pressure for 1 minute until the red alarm light comes on. This is the time needed for the sea water to replace all the fresh water that are in the system, before running pressurized sea water through the membranes.

RUNNING FRESH WATER IN HIGH PRESSURE THROUGH THE MEMBRANES WILL DAMAGE THE MEMBRANES!!!

5. Maintenance:

5.3. STERILIZING THE MEMBRANE

When should the membrane be sterilized?

Normally, regular monthly rinsing of the membrane may be all that is required to maintain the membrane. If this is not possible, sterilization will be necessary. A sterilisation procedure should be carried out every six months.

Membrane sterilizing procedure:

1. Manual method: Thoroughly rinse the desalinator with fresh water for 10 minutes, using the three-way valve on the pre-filter. This procedure should be followed while the machine is idle. Pour the sterilizer (entire packet contents) into a bucket containing 8 litres of water. Disconnect the sea water inlet hose and immerse it in the bucket. Run the desalinator without increasing pressure until the bucket is empty. When the bucket is empty and the procedure is completed, the hose can be reconnected. If not, see number 3.

2. The sterilizing procedure can also be carried out using a garden spray: Pour the entire packet contents of sterilizer into a bucket containing 8 litres of fresh water and mix thoroughly. Fill the spray bottle with this mixture and spray the sterilizer into the watermaker inlet, at a spray pressure of 3 to 4 bars. If not, see number 3.

3. Sterilizing cartridge ST2:
   We have developed a sterilizing cartridge which makes this procedure very simple and easy. Cartridge instructions are given in appendix A3. Before using the watermaker again simply rinse with fresh water for a few minutes using the three-way valve on the pre-filter and all traces of the sterilizer will be removed.

5.4. HP Pump

The HP pump is half filled with oil to the indicated level on the gauge. Normally no additional oil is needed throughout the life of the watermaker. However, if refilling is necessary, use multi grade oil 15W40 and do not exceed the indicated level (in the middle of the red mark on the gauge which is on the back of the pump to the opposite of the pump head).

BEWARE: the sticker located on the red oil filling cap of the HP pump is there only for the shipment: it must be removed before use.

6. SPARE PARTS AND ACCESSORIES

Spare parts

Dessalator® systems are very reliable, hardwaring and do not generally require expensive services. Nevertheless an accident is always possible (running without enough water, accidental overpressure, impact,…).

Should the need arise, we supply spare parts and maintenance accessories:

- 5µm 10 ft filter
- driving belt
- motor relays
- production solenoid valve
- HP pump seals and valves
- HP hose (sold by meter)
- Connector for HP tube
- Flowmeter tube

Accessories:

- Sterilizing cartridge ST2
- Sterilizer bag
- Mineralizing cartridge

APPENDIX – A1

REVERSE OSMOSIS

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membrane. This waste, along with the remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids); approximately 2% of the 35,000 PPM/TDS will pass through the membrane. This guarantees drinking water with a TDS value of 500. Please note that the drinking water produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with chlorine or iodine and it should be also mineralized to ensure it remains consumable. Pay attention not to allow chlorine into the desalination system, as this could damage the device.

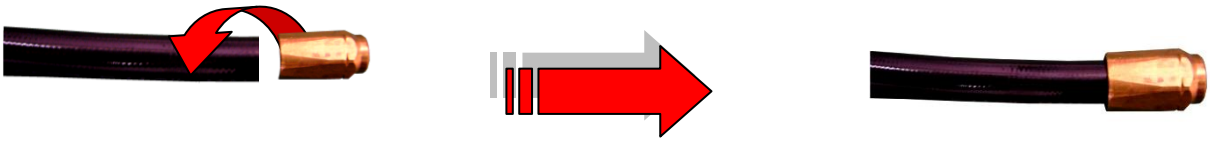
How does your desalinator work?

Sea water enters the inlet valve which penetrates the hull. This sea water is then routed through the 5 µm pre-filter. The filtered water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurised water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: If the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity > 1,000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel. The production capacity of fresh water is achieved with a sea water temperature of 25°C. The output drops by approximately 2,5 to 5% for each degree below 25°C.

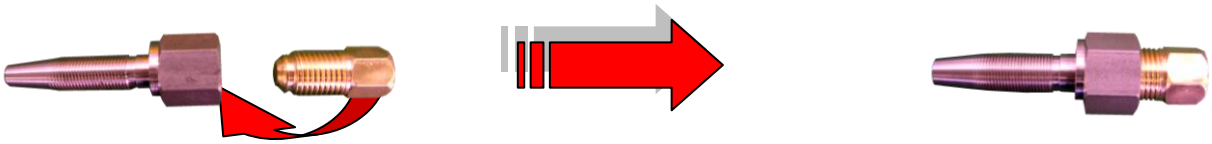
APPENDIX – A2

Installation instructions – HP Connectors

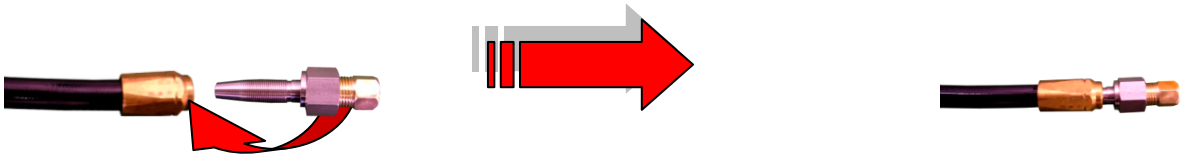
1. Screw the brass union (skirt) anti-clockwise onto the HP pipe, no more than 2.5cm. Stop where the inner threading disappears.



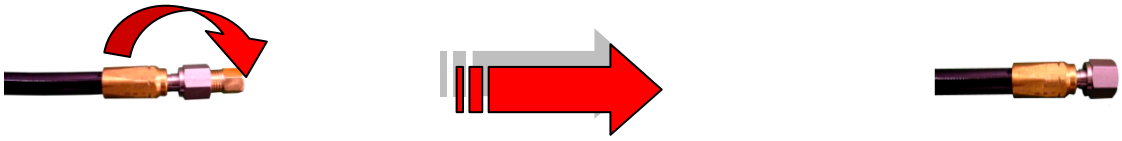
2. Insert the steel tapered end-piece into the stainless steel nut, and tighten very firmly on the male tapered union.



3. Lightly grease the tip of the stainless steel cone and screw it straight into the brass union. Stop where the steel threading disappears into the brass end-piece (a gap of approximately 7mm between the nut and the brass union)



4. Unscrew the nut of the tapered adaptor. The connector is now ready for the hose from pump to membrane. We recommend using an insulating pipe to protect it against vibrations.



5. IMPORTANT: Check carefully that the end-piece does not block the hose:

- Please don't forget to put Loctite or watertight product on the male and female cones when remounting.
- Please check that the HP connector is not blocked up.
  - ➢ either by blowing into the hose
  - ➢ or by inserting a screwdriver to check free passage.

APPENDIX – A3

Sterilizing cartridge – instructions for use

The desalinator is not running:

1. Close the sea water inlet valve.
2. Open the sterilizing cartridge
3. Remove the top grid
4. Place the foam filter at the bottom of the filter
5. Pour the powder into the cartridge
6. Replace the top grid and close the cartridge
7. Check that the seal is properly positioned.
8. Dismantle the basin of the pre filter
9. Remove the 5µm cartridge from the pre-filter.

Remove the 5µm cartridge from the pre-filter

10. Replace with the sterilizing cartridge ST2

Replace the 5µm cartridge with the sterilizing cartridge ST2

11. Set the rinsing valve to pressurized fresh water and rinse, leaving a little sterilizer in the filter.
12. At this point, the desalinator must be switched off
13. The sterilisation remains effective for six months at most. (Repeat after this time as necessary).

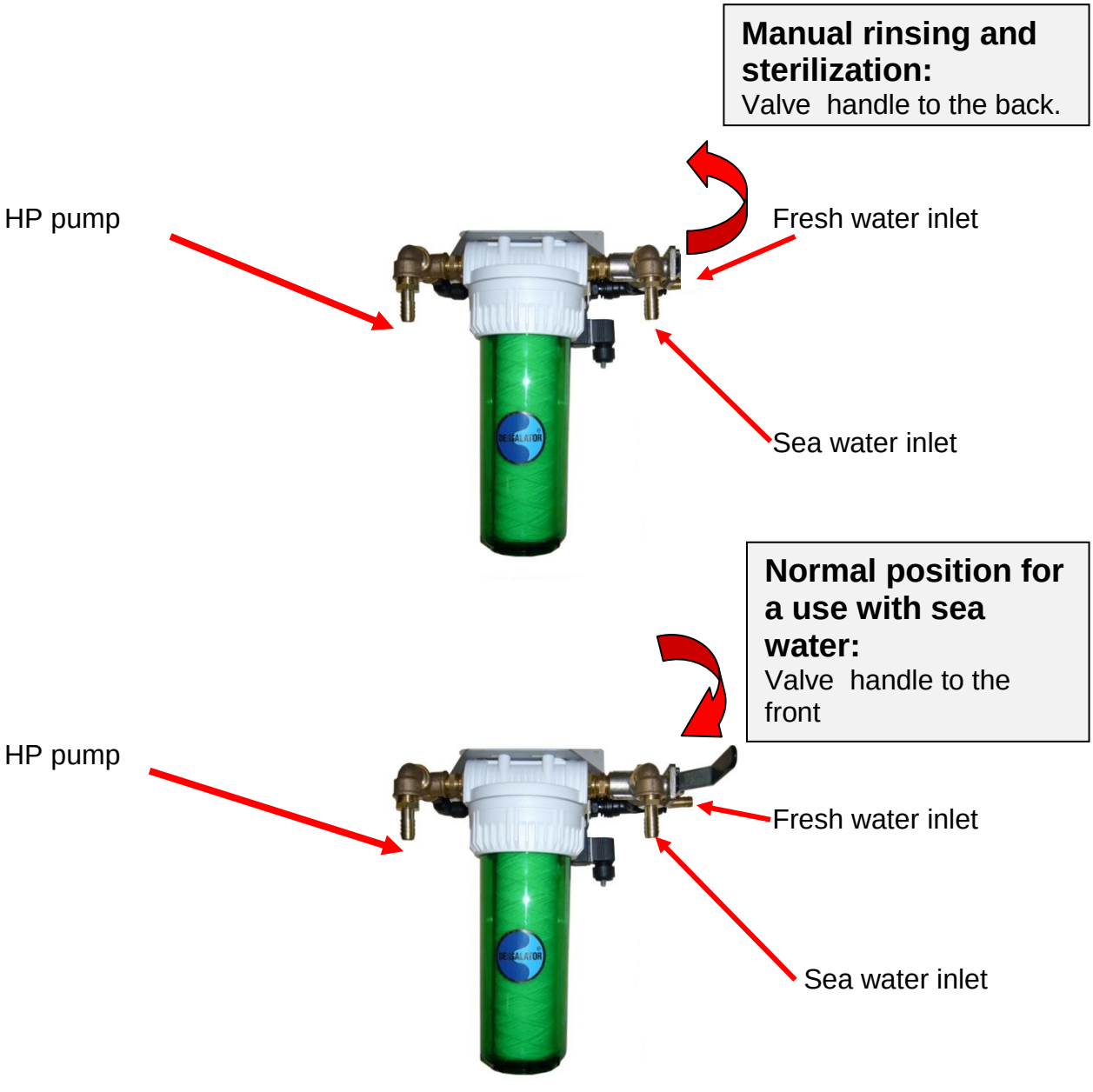
Caution: Before next use, rinse the desalinator thoroughly with fresh water for 15 minutes and ensure that the sterilizing cartridge has been removed and replaced by a 5 µm cartridge.

BEWARE: The ST2 cartridge is reusable.

APPENDIX – A4

Your Dessalator® is equipped with an automated rinsing.
Here below the procedure to rinse manually.

MANUAL RINSING



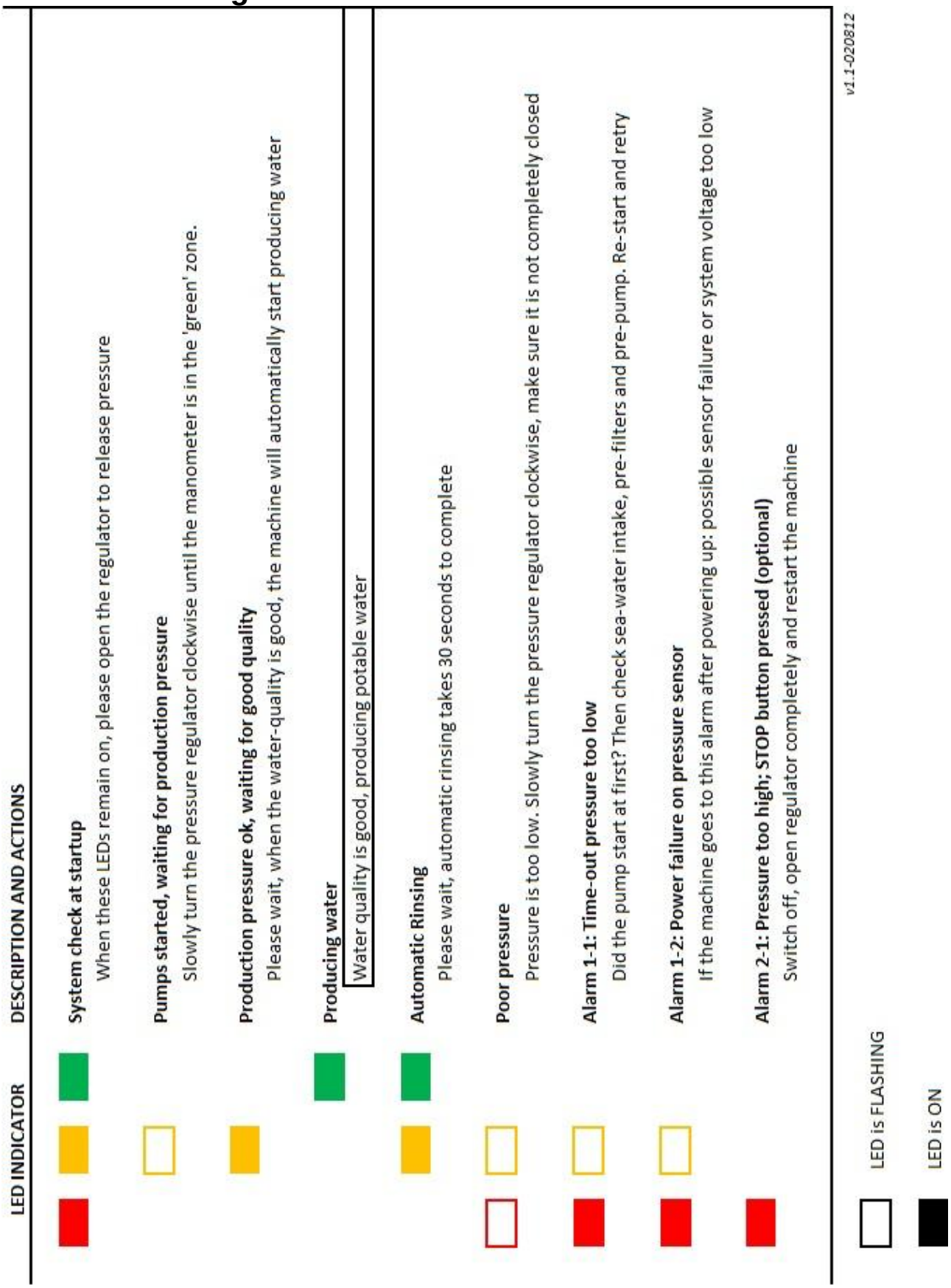
APPENDIX – A5

Troubleshooting

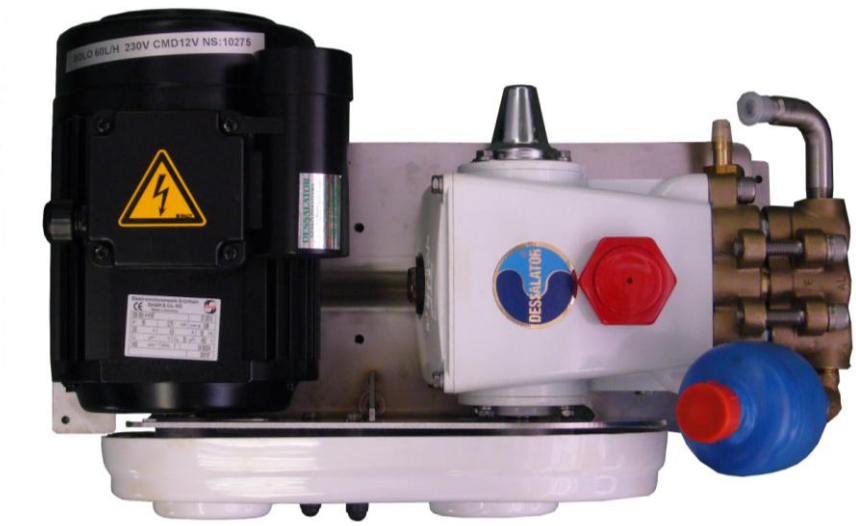
PROBLEM	CAUSE	SOLUTIONS
Leak on the pressure regulator in front of the control panel	Loosened regulation cable gland	Tighten the cable gland with a 12 wrench.
Noisy HP pump.	- Reduced water inlet or air inlet in the system. - Leak on pump head seals.	- Ensure correct size of hoses (diameter), clips and filters secure and filters clean. - Replace seals.
Oil leak on HP pump	Worn seals on connecting rods	- Replace the seals.
Insufficient water flow	- Very cold water - Dirty pre filter - Tension drop on the power cable	- Replace the pre filter - Recharge batteries - Check the connection. - Inadequate power cable section, reinforce cable section.
Water leak under the HP head	- Worn seals	- Replace plunger seals
No pressure reading	Insufficient water	Open the hull valve and / or the rinsing valve
Pressure doesn't come up.	Dirty pump valves	Dismantle and clean the valves in the pump head

APPENDIX – A5

Troubleshooting: led indicator



USER'S MANUAL
DESSALATOR® SOLO 60 LITRES / HOUR



DESSALATOR®

Technical and Sales Departments:
Z.I des 3 Moulins – "Euro 92 – Bât. D – 282 rue des Cistes – 06600 ANTIBES
FRANCE

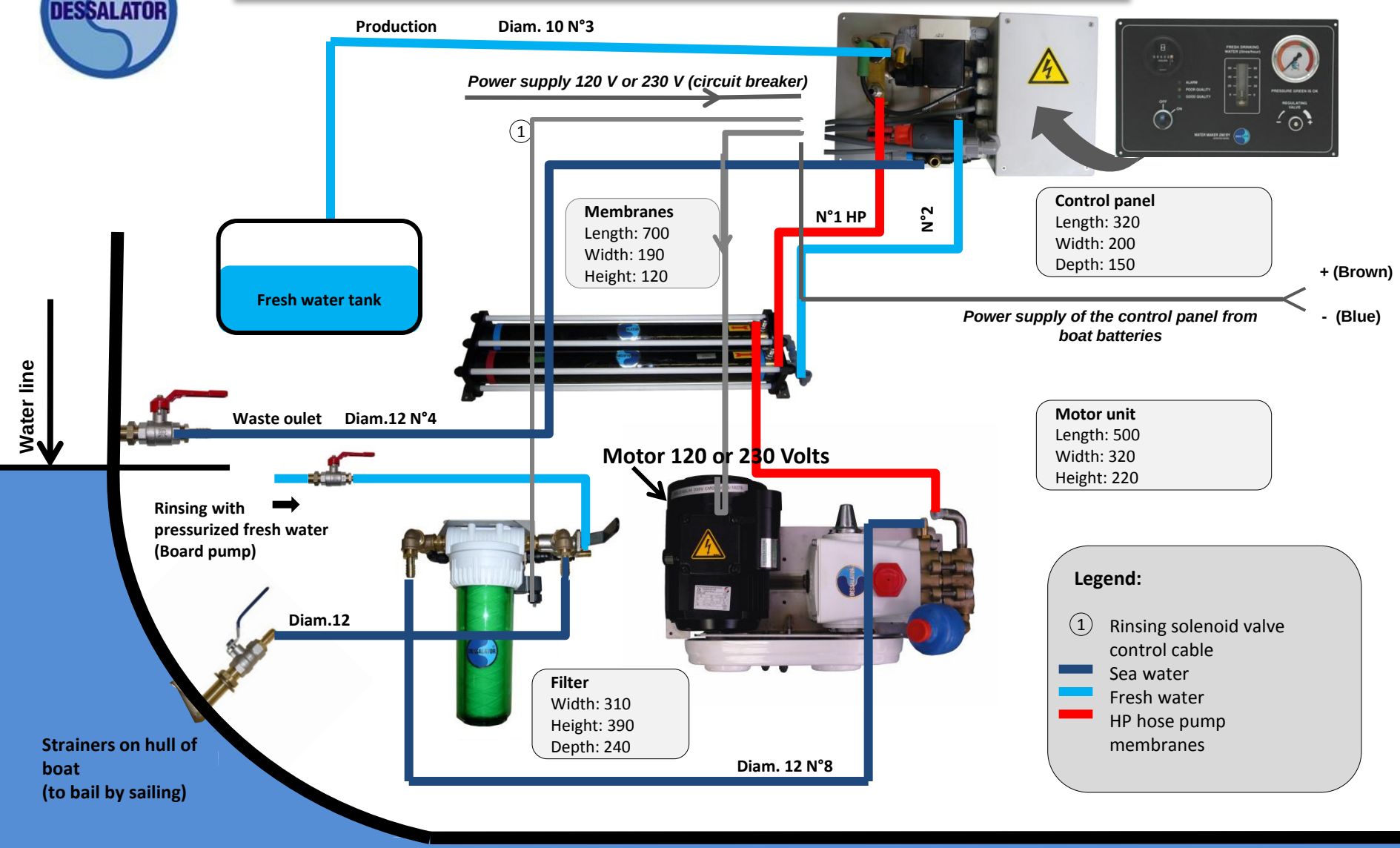
Tel: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66
e-mail: contact@dessalator.com
Web site: www.dessalator.com
Version A4

CONTENTS

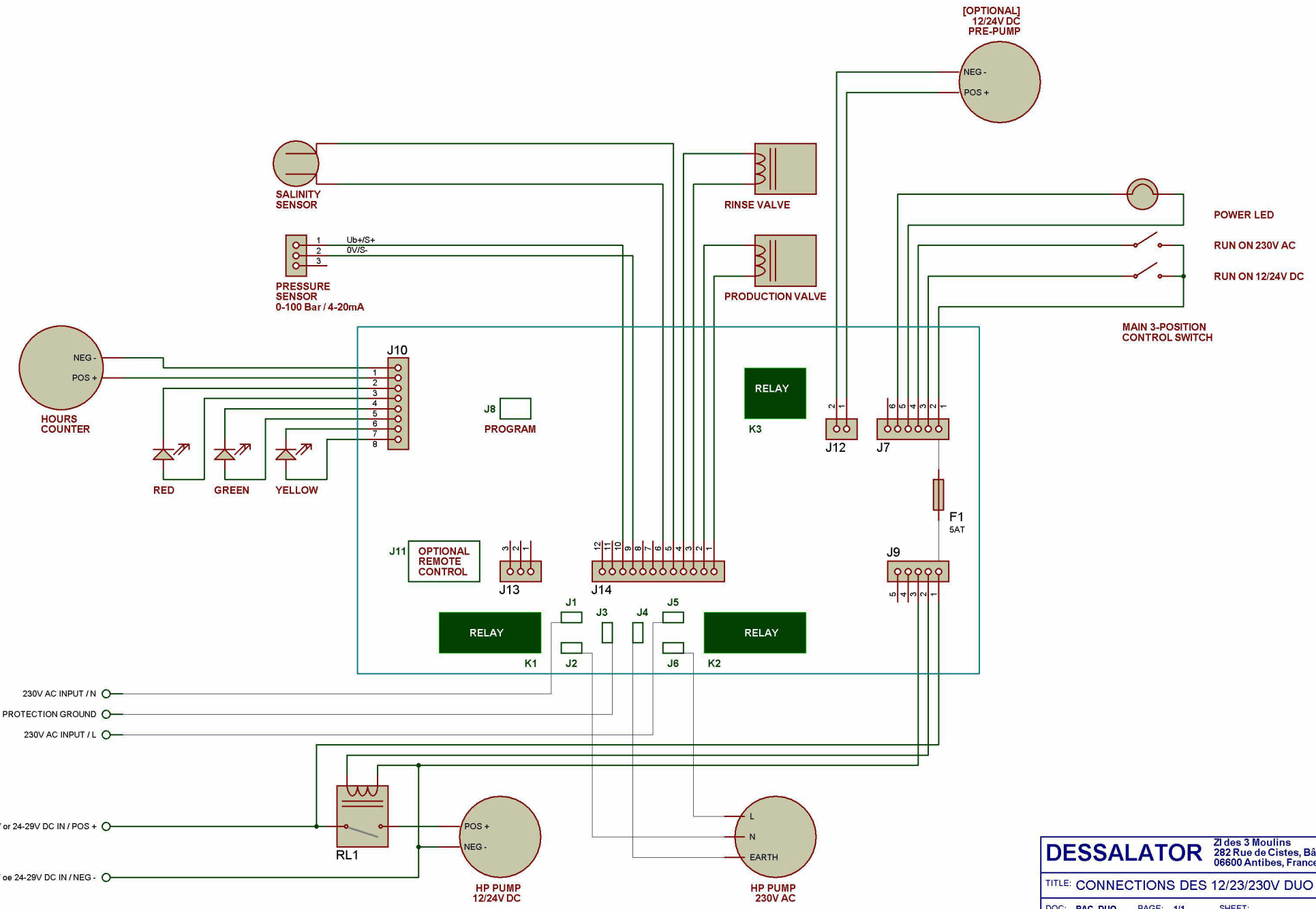
Appendix:

Connections plan title: Connections DES 12/23/230V DUO- Doc : RAC_DUO – 4/12/10

Installation diagram Dessalator SOLO 60 120 or 230 V



DESSALATOR, Z.I. des 3 Moulins-282, rue des Cistes Bât« Euro 92 ». D, 06600 Antibes .
Tél: (33) (0)4 93 95 04 55 Fax: (33) (0)4 93 95 04 66 e-mail: contact@dessalator.com



DESSALATOR

ZI des 3 Moulins
282 Rue de Cistes, Bâtiment Euro 92
06600 Antibes, France

TITLE: CONNECTIONS DES 12/23/230V DUO

DOC:	RAC_DUO	PAGE:	1/1	SHEET:	
REV:	A	DATE:	04/12/10	AUTHOR:	VAK

GREENTRONICS BV - THE NETHERLANDS

1. Components supplied with the Dessalator®:

Version A4

Hull valve:
It must be located the lowest possible in the boat, to the back for a motor yacht or in the centre near the keel for a sailing boat.
The hull valve strainer filters out the larger particles at system entrance.

Pre-filter:
It must be located the nearest possible to the hull valve and be compulsory under the waterline. If not possible, there is a solution: Install a LP pump (optional).
The pre-filter filters out solid particles down to 5 µm at the motor unit inlet. It is supplied with wrench. For automatic rinsing an electro valve is mounted.

Motor-Pump unit:
It must be located compulsory under the waterline
The motor-pump unit is comprised of the 120 or 230 motor and a high pressure pump. **It should be installed in a well-ventilated space**. **BEWARE**: In **120V**, please think of an even **more important ventilation of the motor unit** than in 230V.

Membrane unit:
The membrane unit includes 2 membranes 2521 assembled in a compact frame.

According to the model, a fuse or a circuit breaker is supplied.

Control panel:
It includes a HP gauge, a flowmeter, an on/off switch, a pressure adjustment knob, an operating time meter, 3 indicator lights and a control in 12 or 24 V for security.

Pipes and hoses supplied by Dessalator®:

- High pressure pipes pump/membranes and membranes/control panel (2 pipes and 4 special connectors)
- Water production pipe membrane / control panel.

Additional hardware needed for assembly:

- Miscellaneous screws (including Parker)
- Stainless jubilee clips ∅ 10 and ∅12
- Assortment of plastic rings (tie wraps)
- Teflon tape or insulating water proof tape
- Silicon Rubson mastic, Sicaflex or equivalent
- Ribbed insulating pipe for cables and HP tubes
- Tricoflex hoses ∅ 10 and ∅ 12
- Power cable: 35mm² for the 12V and 20mm² for the 24V
- Various tools (electric drill, saw, …)

2. How to install the watermaker:

2.1 Sea water inlet

Sea water inlet valve:

The strainer should be positioned as low as possible below the waterline and as far as possible from the deck waste oulet. Drill the hull ∅ 21mm. The grooves on the strainer should be facing forward (towards the bow) for maximum water intake when the boat is moving forward. Please seal watertight with Rubson mastic or Sicaflex and ensure that the immersed part is painted with underwater grade paint.
The hull valve should be accessible for maintenance. Make the valve / strainer and valve / hose connector watertight using 577 Loctite or Teflon tape.

Cartridge pre-filter:

The pre-filter should also be positioned as low as possible below the waterline and it should remain accessible. The mounting bracket is reversible, which facilitates the height positioning. The hose connection must be done with 12mm inner diameter Tricoflex for all the sea water circuit and the pressurized rinsing. Don't forget to place two stainless steel collars on each connection. 5cm space should be left below the filter body to allow the filter basin to be removed. A wrench is supplied to dismantle the filter. The fresh water pressurized rinsing must be connected to the output of your board pump. An electro-valve is mounted on the output (diam. 12) for automatic rinsing. It can be connected under a sink, a wash basin or on the way of pressurized cold water hoses. The valve handle must be positioned to the front when the water maker is working. For a manual rinsing, please move the valve handle to the back. When replacing the filter cartridge, please check that the O-ring seal for the basin is secure and that the bleeder screw is tightened and fill the circuit with fresh water without pressure again for 3 to 4 minutes, put then the handle to the front.

.

Connections:

Hull valve / three-way valve, Pre-filter / pump, Fresh water / three-way valve / rinsing electro valve
The sea water inlet valve should be connected to the pre-filter using a tricoflex hose of inner ∅ 12mm, for sea water circuit and rinsing under pressure. Mount two jubilee clips at each joint, with their tightening heads positioned diametrically opposite on the hose. Connect the pressurized fresh water from the water oulet to the three-way valve. This connection can be made under a sink, wash basin or anywhere on the length of the pressurized fresh water pipe. When operating in sea water mode, the valve handle should be positioned in line with the filter (see photo above).

Recommendation:

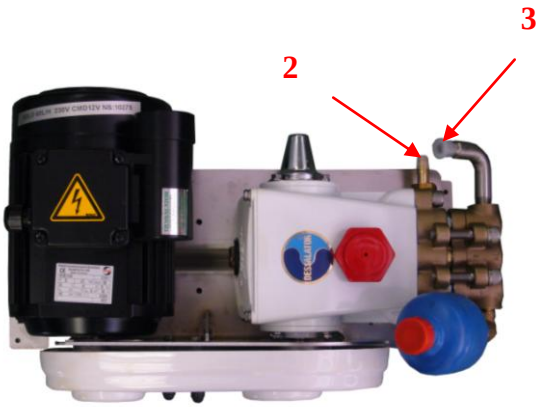
If the pipe must pass through dividing walls or touch sharp edges, use an insulating pipe or tube superior to the pipe diameter to protect it against wear and friction.

2. How to install the desalinator:

2.2 Motor unit:

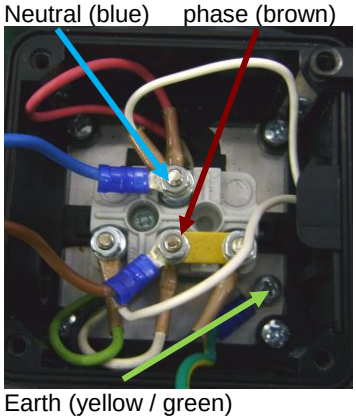
1

The HP motor unit should be installed as low as possible in the boat in a horizontal position and it must be protected from water spray as much as possible. The unit is mounted using two brackets under the two motors leaving a few centimetres clear space around the unit, to get sufficient air circulation space for motor cooling. The connection between the prefilter[1] oulet and the inlet to the low pressure side of the pump[2] is in Tricoflex hose of ∅ 12mm with doubled stainless jubilee clips at each joint.
The HP head of the pump is connected to the membrane inlet (red mark) through an HP pipe, cut to the appropriate length (see installation of connectors appendix A2).
Apply a little liquid Loctite or nut seal on the male and female cones before joining.



2.3 Electrical connections:

Neutral (blue) phase (brown)



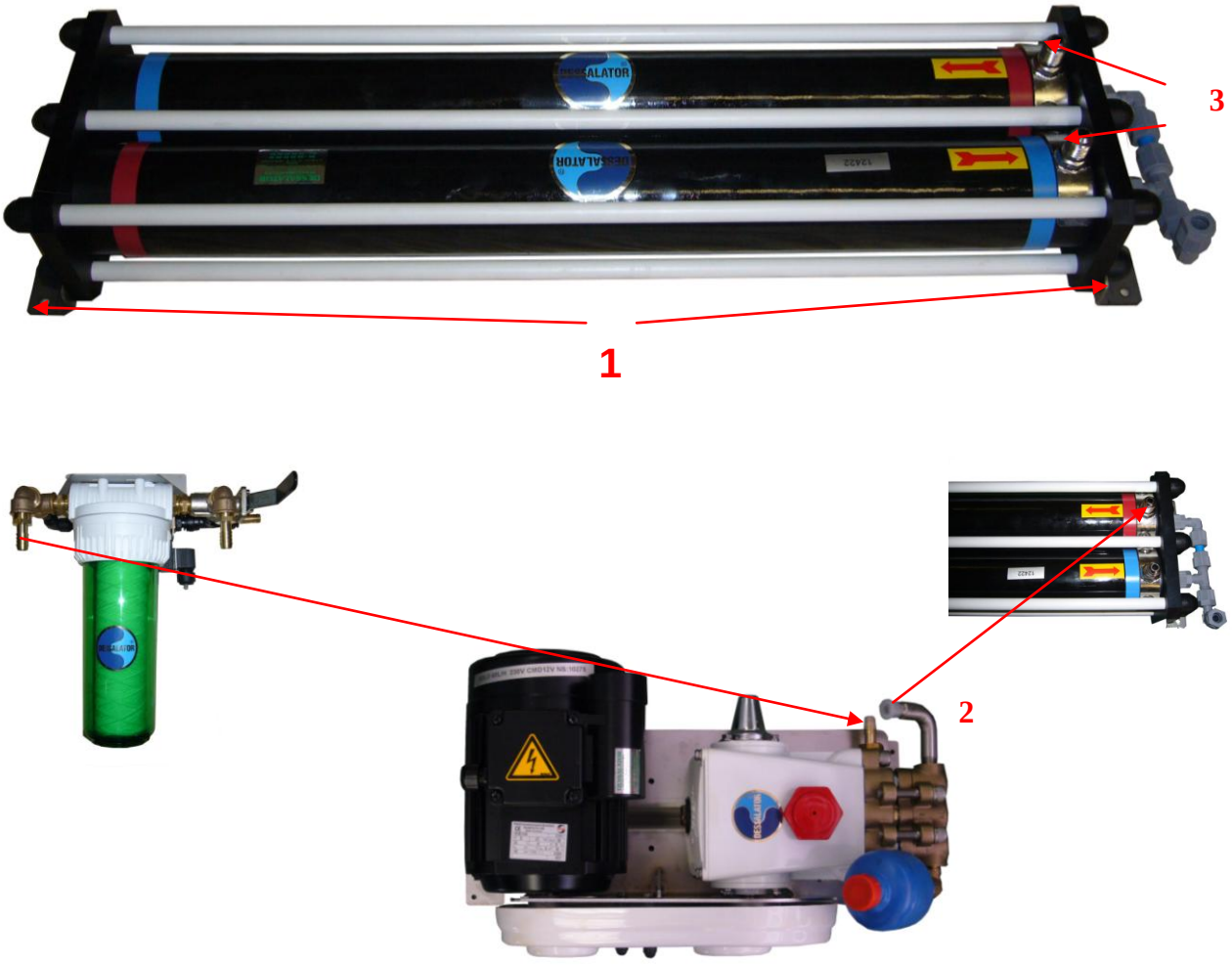
Earth (yellow / green)

CAUTION: POWER SUPPLY SHOULD BE SWITCHED OFF BEFORE WORK IS CARRIED OUT.

Please connection the 120 or 230 V motor according to the installation diagram. Depending on the voltage, we supply an adequate circuit breaker.

2. How to install the desalinator:

2.4 Membrane unit

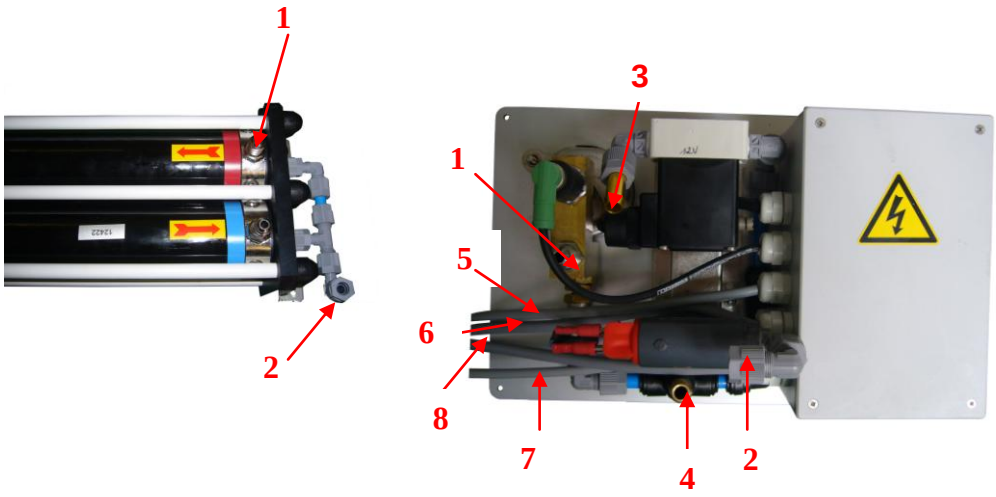


The membranes can be installed horizontally, preferably flat or on a wall support. They are mounted using 8 Parker screws in *stainless steel brackets*[1]. As the hose from the HP pump[2] vibrates, it is preferable to install the hose with an insulating tube. The HP connectors should be installed strictly in accordance with the instructions (Appendix A2). Apply a little loctite or nut seal to the two male and female cones before tightening.

Recommendation: To facilitate the connection[3], it is possible to rotate the heads through 90° by unscrewing the grey production connectors. Remove the nut covers and loosen the 12 nuts maintaining the unit. Remove the rod to obtain access and rotate the membrane head using a box wrench to join the stainless steel connector. Reinstall the rod and tighten the assembly.

2. How to install the desalinator:

2.5 Control panel:



The control panel must be mounted on a vertical surface as close as possible to the motor / pump unit and to the membranes. Leave space behind the panel to facilitate the connections. It is recommended that it is installed at the bottom or on the sides of cupboards, under chart table or main cabin seats, on the front panel of a rear bunk, …

The panel has the following water connections:

- HP hose[1]
- Production hose exiting the membranes (blue hose)[2]
- Production hose from panel to tanks[3]: a 10mm inner ∅ Tricoflex hose will be required which must be connected either to the fresh water tanks or to the distribution manifold on the fresh water unit inlet provided there is no constricting valve on the fresh water tank outlet.
- A Tricoflex waste oulet inner ∅ 12mm hose[4] will also be required which can be connected to a sink, wash basin or cockpit water drain, to avoid having the hull re-drilled. If this is not possible, remember to open the outlet valves before using the Dessalator.

Electrical connection:

- The cable[5] is for the rinsing valve connection, the cable[6] is connected to 120 or 230 volts, the cable[7] must be powered in 12 or 24 V on board low tension network (brown: positive connection, blue: negative connection), the cable[8] is connected to the motor.

3. Starting the Dessalator®:

1. Ensure the valves are open before starting up the desalinator (Hull valve and waste oulet valve if relevant)

2. **To be done compulsory:**
   For the first use, after the replacement of the filter, when lifting the boat out of the water or for a long period of not using your water maker, please fill the circuit with fresh water: put the handle valve on the pre filter to the back; this operation should be done for 3 or 4 minutes, water maker stopped and pressure captor open (fully anti-clockwise). Once the circuit is full of fresh water put the valve handle of the pre filter to the front.

3. To start the water maker, the pressure regulator must be open. Switch on.

4. Turn the pressure regulator dial to the right until the HP gauge reading is in the orange zone then gradually adjust until the needle reaches the beginning of the green zone. Check that the pressure remains constant. The purpose of this operation is to remove air from the system and to obtain a more constant pressure while the water maker is running.

5. Fresh water quality and flow into the tank is automatically monitored by the electronics board.

6. If pressure becomes too high the water maker will cut out and the red indicator will light up. If this occurs, reduce pressure, switch off and restart the water maker.

7. To shut down the water maker: switch off then reduce pressure.

8. To shut down with rinsing, please see explanations page 8 and 9.

9. If the water maker is not used for extended periods of time it should be rinsed preferably once a month. If not, the membranes will have to be sterilized for the storage (for 6 months).

Note: Fresh water production depends on the temperature of the sea water and on the cleanness of the 5µm pre-filter.

4. Directions for use:

MEMBRANES DELICATE COMPONENTS

Reverse osmosis membranes must be carefully maintained as they are the most delicate elements of the system. We recommend that the maintenance instructions are carefully followed to prevent the membranes from damage and to ensure the guarantee is not invalidated. Maximum production capacity of the desalinator is achieved with a sea water temperature of 25°C. The functioning of the membranes will vary depending on the temperature of the sea water. Output drops by approximately 2.5% to 5% for each degree below 25°C.

Extreme temperatures:

The membranes should not be exposed to temperatures below 0°C. Overpressure due to expansion caused by freezing can rupture the membranes and prevent the salt from being filtered out. The membranes must not be exposed to temperatures above 60°C as high temperatures may also prevent salt from being removed.

Drying out of the membranes:

The membranes should be permanently immersed in liquid either sea water before treatment, fresh water provisionally stored or sterilizing liquid if the desalinator is not used for extended periods of time (See sterilization methods appendix A3). Sterilizer is effective for six months and must be replaced after this period of time.

Recommendations for use:

The various quality and salinity grades of sea water affect both membrane efficiency and the working of the desalinator in Marinas. **The system is not recommended for use in muddy or polluted water (briny water, river, Red Sea), which can clog the pre-filter and damage the membranes.** However, if the desalinator has to be used in such conditions only run it for very short periods, as soon as clean sea water becomes available rinse the membrane and run the system without pressure for 30 minutes with the pressure regulator open.

5. Maintenance:

CAUTION: IN FREEZING CONDITIONS, PLEASE EMPTY THE FLOWMETER TUBE ON THE CONTROL PANEL BY DISCONNECTING THE PRODUCTION HOSE AND BLOWING OR INJECTING AIR INTO THE HOSE, PROTECT YOUR MEMBRANES WITH BLANKETS.

5.1. Maintaining the membrane

After 1,000 working hours, it is normal that the flow lowers between 10 and 15%. If more, you should think of replacing the membranes.

- The volume of production of your watermaker can be made over the first 24 to 48 hours of operation. If the drinking water produced falls below the normal working specifications (sea water containing a TDS of 35,000 ppm, a sea water temperature of 25°C, and pressure of 65 bars), and if production is not improved by rinsing the membrane, then the membrane has to be replaced.

- Please take into consideration that the volume of drinking water produced is dependent on ideal sea water temperature and on pressure in the system. Therefore, if the volume of drinking water produced falls it does not necessarily mean that the membrane need to be replaced.

5.2. Rinsing the membranes

Once a week, the watermaker needs to be flushed with fresh water before using it to make fresh water. There is no need to flush it with fresh water after each use, as this is just a waste of water that is taken from the boat's tank.

There are 2 methods to flush the system: manual and automatic.
Both systems are using the water that are in the tanks of the boat, and there is no use in water from the dock or a connection of any hose from a source outside the boat.

Remember: <u>The biggest enemy of the membranes is fresh water.</u>

Fresh water should be always used with no pressure when going through the system (pressure dial turned all the way anti clockwise) and the system should always run with no pressure after a fresh water flush to dump all the fresh water that are in it, before making freshwater from sea water (also with the pressure dial all the way anti clockwise).
When running the watermaker with the dial all the way anti clockwise, it will shut it self down automatically after 1 minute. Only then, the watermaker is ready for use.

5. Maintenance:

Manual Flush

Next to the pre filter there is a valve. The valve is connected to the fresh water system of the boat and turning it, will automatically start the boat's water pump and a flow of fresh water from the tank to the watermaker.

1. **Don't turn the watermaker ON**. Leave it on it's OFF position.
2. Turn the pressure dial all the way anti clockwise.
3. Turn the valve of the fresh water intake, which is located next to the filter, for 2 minutes. The boat's water pump will start and fresh water will run through the watermaker.

Automatic Flush

After using the watermaker, don't switch it off.

While the watermaker is still running, turn the pressure dial all the way anti clockwise. The watermaker will stop making water and will automatically start the flushing process. The green and orange lights on the control panel will turn on, which indicates that flushing is in process. This should take 30 seconds and will stop automatically. The green and orange lights will shut off and the only indicator will be the blue flashing light on the ON/OFF button, to remind you to shut the watermaker OFF.

The automatic flush is a better way to flush the system since it's not only flushes the sea water out, it also back wash the pre-filter and dumps all the dirt and debris that accumulated in the filter's housing, back to the sea, through the sea water intake.

DON'T FORGET!!!

After each system flushing, before using the watermaker you need to:

1. Make sure the pressure dial is turned all the way anti clockwise.
2. Turn the watermaker ON and let it run with no pressure for 1 minute until the red alarm light comes on. This is the time needed for the sea water to replace all the fresh water that are in the system, before running pressurized sea water through the membranes.

RUNNING FRESH WATER IN HIGH PRESSURE THROUGH THE MEMBRANES WILL DAMAGE THE MEMBRANES!!!

5. Maintenance:

5.3. STERILIZING THE MEMBRANE

When should the membrane be sterilized?

Normally, regular monthly rinsing of the membrane may be all that is required to maintain the membrane. If this is not possible, sterilization will be necessary. A sterilisation procedure should be carried out every six months.

Membrane sterilizing procedure:

1. Manual method: Thoroughly rinse the desalinator with fresh water for 10 minutes, using the three-way valve on the pre-filter. This procedure should be followed while the machine is idle. Pour the sterilizer (entire packet contents) into a bucket containing 8 litres of water. Disconnect the sea water inlet hose and immerse it in the bucket. Run the desalinator without increasing pressure until the bucket is empty. When the bucket is empty and the procedure is completed, the hose can be reconnected. If not, see number 3.

2. The sterilizing procedure can also be carried out using a garden spray: Pour the entire packet contents of sterilizer into a bucket containing 8 litres of fresh water and mix thoroughly. Fill the spray bottle with this mixture and spray the sterilizer into the watermaker inlet, at a spray pressure of 3 to 4 bars. If not, see number 3.

3. Sterilizing cartridge ST2:
   We have developed a sterilizing cartridge which makes this procedure very simple and easy. Cartridge instructions are given in appendix A3. Before using the watermaker again simply rinse with fresh water for a few minutes using the three-way valve on the pre-filter and all traces of the sterilizer will be removed.

5.4. HP Pump

The HP pump is half filled with oil to the indicated level on the gauge. Normally no additional oil is needed throughout the life of the watermaker. However, if refilling is necessary, use multi grade oil 15W40 and do not exceed the indicated level (in the middle of the red mark on the gauge which is on the back of the pump to the opposite of the pump head).

BEWARE: the sticker located on the red oil filling cap of the HP pump is there only for the shipment: it must be removed before use.

6. SPARE PARTS AND ACCESSORIES

Spare parts

Dessalator® systems are very reliable, hardwaring and do not generally require expensive services. Nevertheless an accident is always possible (running without enough water, accidental overpressure, impact, …).

Should the need arises, we supply spare parts and maintenance accessories:

- 5µm 10 ft filter
- driving belt
- motor relays
- production solenoid valve
- HP pump seals and valves
- HP hose (sold by meter)
- Connector for HP tube
- Flowmeter tube

Accessories:

- Sterilizing cartridge ST2
- Sterilizer bag
- Mineralizing cartridge

APPENDIX – A1

REVERSE OSMOSIS

What is the reverse osmosis principle used in your desalinating system?

Sea water is forced at high pressure through the membranes which act as “molecular sieves”, only allowing pure fresh water to pass through. Most dissolved solid particles will not penetrate the membrane. This waste, along with the remaining saline solution, will flow on the surface of the membranes and will be rejected. Not all particles dissolved in sea water can be eliminated. The system is designed to reject 99% of the TDS (Totally Dissolved Solids); approximately 2% of the 35,000 PPM/TDS will pass through the membrane. This guarantees drinking water with a TDS value of 500. Please note that the drinking water produced by your reverse osmosis system is essentially sterile, however, your fresh water storage should be treated periodically with chlorine or iodine and it should be also mineralized to ensure it remains consumable. Pay attention not to allow chlorine into the desalination system, as this could damage the device.

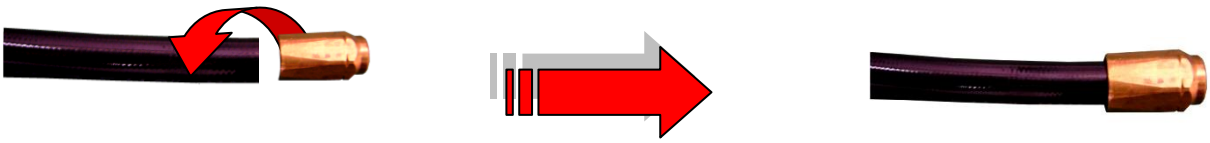
How does your desalinator work?

Sea water enters the inlet valve which penetrates the hull. This sea water is then routed through the 5 µm pre-filter. The filtered water is forced through the membrane by the HP pump (operating pressure 60 to 65 bars). The pressurised water passes through the surface holes of the membranes depositing the salt and minerals, which are then rejected into the sea with the remaining solution. The now fresh water flows over a detector which measures its salt content: If the desalination achieved is satisfactory, the three-way valve automatically directs the fresh water to the tank. If the salinity values measured by the salinity probe are too high (conductivity > 1,000 siemens), the valve will reject the water produced into the sea. The volume of drinking water being treated at any time is monitored by a flowmeter on the control panel. The production capacity of fresh water is achieved with a sea water temperature of 25°C. The output drops by approximately 2,5 to 5% for each degree below 25°C.

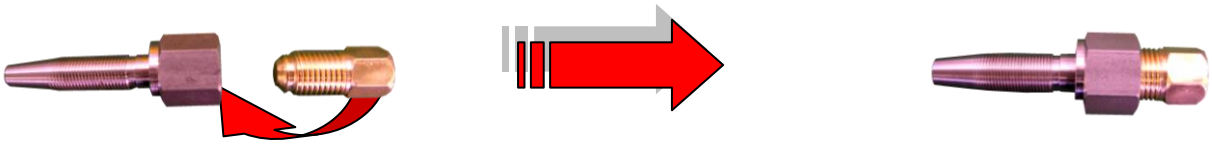
APPENDIX – A2

Installation instructions – HP Connectors

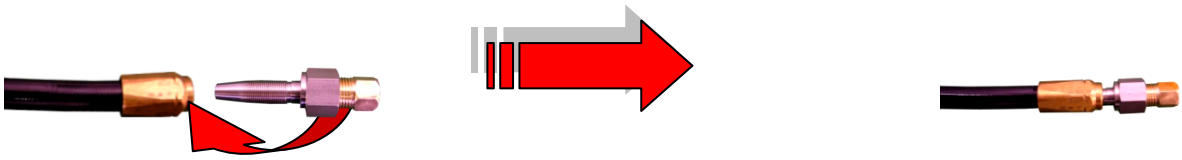
1. Screw the brass union (skirt) anti-clockwise onto the HP pipe, no more than 2.5cm. Stop where the inner threading disappears.



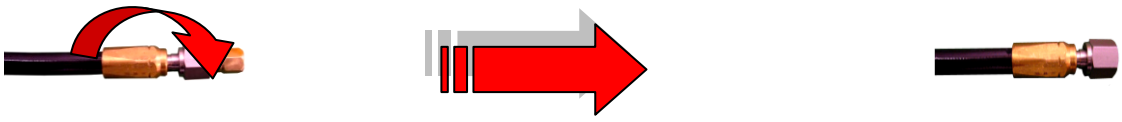
2. Insert the steel tapered end-piece into the stainless steel nut, and tighten very firmly on the male tapered union.



3. Lightly grease the tip of the stainless steel cone and screw it straight into the brass union. Stop where the steel threading disappears into the brass end-piece (a gap of approximately 7mm between the nut and the brass union)



4. Unscrew the nut of the tapered adaptor. The connector is now ready for the hose from pump to membrane. We recommend using an insulating pipe to protect it against vibrations.



5. IMPORTANT: Check carefully that the end-piece does not block the hose:

- Please don't forget to put Loctite or watertight product on the male and female cones when remounting.
- Please check that the HP connector is not blocked up.
  - either by blowing into the hose
  - or by inserting a screwdriver to check free passage.

APPENDIX – A3

Sterilizing cartridge – instructions for use

The desalinator is not running:

1. Close the sea water inlet valve.
2. Open the sterilizing cartridge
3. Remove the top grid
4. Place the foam filter at the bottom of the filter
5. Pour the powder into the cartridge
6. Replace the top grid and close the cartridge
7. Check that the seal is properly positioned.
8. Dismantle the basin of the pre filter
9. Remove the 5µm cartridge from the pre-filter.

Remove the 5µm cartridge from the pre-filter

10. Replace with the sterilizing cartridge ST2

Replace the 5µm cartridge with the sterilizing cartridge ST2

11. Set the rinsing valve to pressurized fresh water and rinse, leaving a little sterilizer in the cartridge.
12. At this point, the desalinator must be switched off
13. The sterilisation remains effective for six months at most. (Repeat after this time as necessary).

Caution: Before next use, rinse the desalinator thoroughly with fresh water for 15 minutes and ensure that the sterilizing cartridge has been removed and replaced by a 5 µm cartridge.

BEWARE: The ST2 cartridge is reusable.

APPENDIX – A4

Your Dessalator® is equipped with an automated rinsing.
Here below the procedure to rinse manually.

MANUAL RINSING

Manual rinsing and sterilization:
Valve handle to the back.

Normal position for a use with sea water:
Valve handle to the front

APPENDIX – A5

Troubleshooting

PROBLEM	CAUSE	SOLUTIONS
Leak on the pressure regulator in front of the control panel	Loosened regulation cable gland	Tighten the cable gland with a 12 wrench.
Noisy HP pump.	- Reduced water inlet or air inlet in the system. - Leak on pump head seals.	- Ensure correct size of hoses (diameter), clips and filters secure and filters clean. - Replace seals.
Oil leak on HP pump	Worn seals on connecting rods	- Replace the seals.
Insufficient water flow	- Very cold water - Dirty pre filter - Tension drop on the power cable	- Replace the pre filter - Recharge batteries - Check the connection. - Inadequate power cable section, reinforce cable section.
Water leak under the HP head	- Worn seals	- Replace plunger seals
No pressure reading	Insufficient water	Open the hull valve and / or the rinsing valve
Pressure doesn't come up.	Dirty pump valves	Dismantle and clean the valves in the pump head

APPENDIX – A5

Troubleshooting: led indicator