

# Whisper 90 modular



Whisper 90 modular

Whisper 90 modular  
12/24 Volt DC/230VAC

User Guide and Installation handbook

**PureWater**   
*Das Trinkwasser aus dem Meer*

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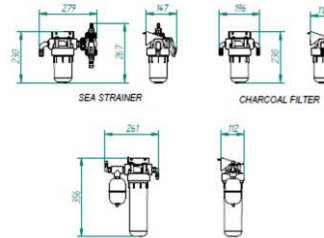
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## Whisper 90 modular Guide

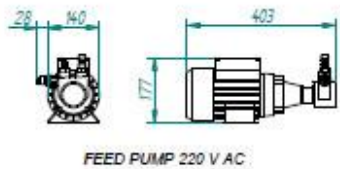
### The Whisper 90 modular, individual parts:



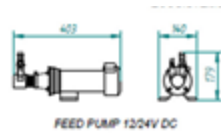
Basic Unit



Filtersystem Whisper



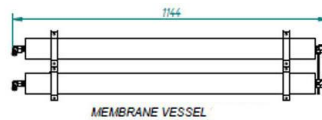
Vane Pump 230V



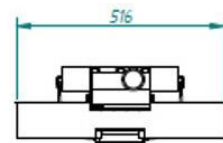
Feed Pump



Main Panel



Pressure Vessels



ETD

The dimensions of Motor and pump are subject to change, because different motors are used.

The pressure Vessels are coming already mounted together. All HP connections have seals. Don't tighten to strong, this could damage the seal.

### Vorsichtsmaßnahmen **Precautionary**

Bitte beachten Sie folgende Punkte bevor Sie Ihre SEA STAR Anlage einbauen und in Betrieb nehmen!  
**Please pay attention to the following point's bevor you install the system.**

1. Die Anlage sollte innerhalb von 12 Monaten nach Auslieferung in Betrieb genommen werden.  
**You should take the unit into service within 12 month.**
2. Die Anlage sollte ca. alle 7 Tage, oder in sehr heißen Gebieten alle 3 Tage mit Seewasser betrieben oder mit Frischwasser gespült werden. **You should flush the unit every 14 days, or in hot climate every 7 days.**
3. Wenn die Anlage für eine lange Zeit außer Betrieb ist, sollte sie spätestens nach 12 Monaten gespült und neu konserviert werden. **If you have the unit not in use for a very long period, you should flush and preserve the unit every 12 month.**
4. Betreiben Sie die Anlage nie in Häfen oder in Gebieten wo Kraftstoff und Öl im Seewasser ist.  
**Don't use the unit in ports and areas where the seawater is contaminated with fuel and oil.**
5. Wenn Sie die Anlage in Frisch- oder Brackwasser betreiben sind keine weiteren Maßnahmen zu ergreifen.  
**No action has to be taken if you use the system in fresh or brackish water.**
6. Schützen Sie die Anlage vor Frost. **Prevent the unit from freezing**
7. Lassen Sie die Membran nicht austrocknen. Wenn Sie die Membran aus irgendeinem Grund ausbauen, ist es wichtig, dass sie sofort versiegelt wird. **Don't let the membrane dry out.**
8. **The Sea Water inlet should be a type which presses the water in during cruise.**
9. **Check the pre-filter condition regularly, when in use, an interval of every two weeks is recommended.**
10. **We recommend, flushing the unit after every use with fresh water.**

### **Caution!!!**

**The amount of produced fresh water is depending on Sea Water temperature and salinity.  
For temperatures below 25°C you lose per 1°C – 3% of rated fresh water output performance.  
If the salinity is higher than 35000 PPM you could also lose output performance.**

## 1.0 GENERAL THEORY OF OPERATION

### 1.1 REVERSE OSMOSIS THEORY

Reverse osmosis, like many other practical scientific methods, developed from processes first observed in nature. Osmosis is a naturally occurring phenomenon in which a semi-permeable membrane separates a pure and a concentrated solution (a semi-permeable membrane is defined as one that preferentially passes a particular substance). Every fluid has an inherent potential that is directly related to the type and amount of solids in solution. This potential, referred to as osmotic pressure, increases in proportion to relative concentration of a solution. A concentrated solution, therefore, has an osmotic pressure that is higher than that of a pure solution. In an osmotic system, the less concentrated solution will attempt to equalize the concentrations of both solutions by migrating across the semi-permeable membrane. When enough pure solution migrates across the membrane such that the inherent potential difference between the solutions is no longer higher than the osmotic pressure of the membrane, the purer solution will stop flowing. If the pressure on the concentrated solution is increased to above the osmotic pressure, fluid flow will be reversed. This condition, called Reverse Osmosis, can be established by artificially pressurizing the more concentrated solution using a high pressure pump. In this type of system, the concentrated solution (normally referred to as feed-water) will become more concentrated as pure water flows out of solution and across the membrane to the permeate side. Discounting the effects of feed-water temperature and salinity, the operating pressure normally required to produce significant amounts of pure water is at least twice the osmotic pressure of the membrane being used. **Fig. 1.1**

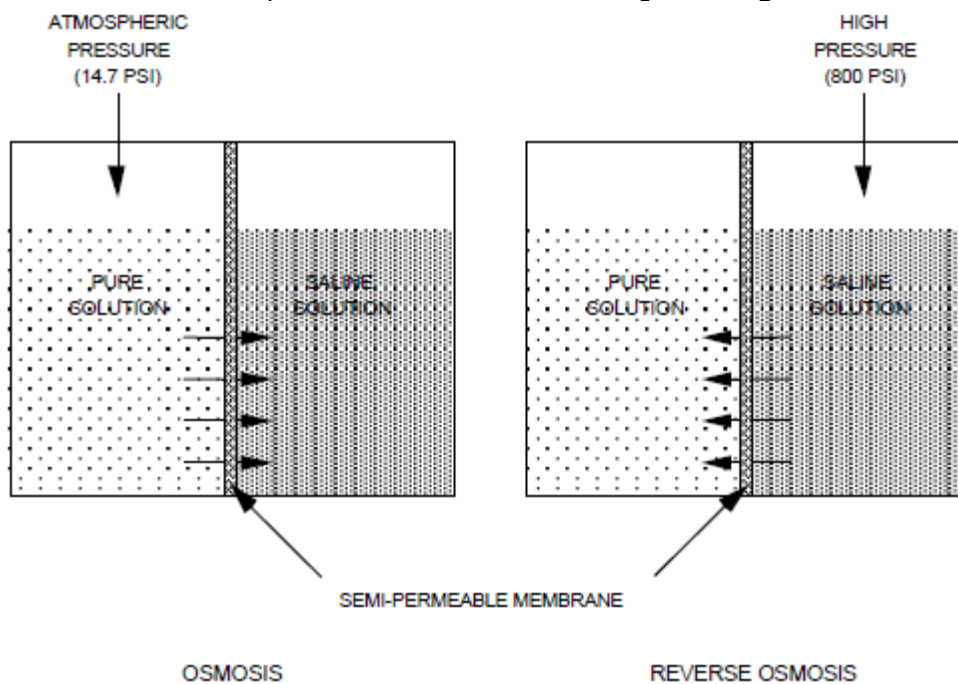


Figure 3.0 - Simple (Reverse) Osmosis Process

### 1.2 APPLICATION OF REVERSE OSMOSIS

Seawater contains many kinds of solids dissolved in solution. The most prevalent is common table salt (Sodium- Chloride). Other minerals that may be present in solution are substances that usually contain Various Compounds of Calcium and Sulfate. The sum of all of the solids dissolved in a particular sample of water is referred to as *Total Dissolved Solids* or TDS. Seawater normally averages 32,000 ppm (parts per million) TDS although variations of 5000 ppm are common in various parts of the world. The fundamental goal any desalination process is a significant reduction in the amount of dissolved solids in water.

## Whisper 90 modular Guide

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In a Reverse Osmosis desalination system, most of the dissolved solids do not pass through the Membrane but are instead carried along the membrane surface. This rejected water, referred to as *Brine*, becomes increasingly more concentrated as it flows across the surface of the membranes and is eventually piped to drain. The product water that flows through the membrane is referred to as *Permeate*. The percentage of feed-water that enters the unit converted to permeate is called the *Recovery rate*. On the Whisper systems the recovery rate is fixed at about 10%.

It should be noted that no system is capable of removing all 100% of the dissolved solids from Seawater. Designed to reject approximately 99% of the TDS, the system allows 1% of the 35,000 ppm TDS in the seawater to pass into the product water. This yields product water of less than 500 ppm, the recommended TDS for drinking water. A system such as this is said to have a *salt passage* of 1%.

## 2.0 Whisper 90 System

### 2.1 The general scope of application for the WHISPER systems

You can use the WHISPER systems without restriction in all oceans around the world and in brackish water areas. Take care in areas where sea water is contaminated with plankton. You must than check the strainer more often. **Clogging of the strainer could cause the vane pump run dry and fail.**

The advantages of the WHISPER systems are:

- No pressure regulation, the system regulates the pressure by itself.
- A whisper quiet system.
- Because of the energy recovery a good balance of power consumption.

### Function

The heart of the system is the **ETD (Energy Transfer Device)**

The ETD produces out of a large volume of water with low pressure, high pressure, with a low volume of water. The built in Energy recovery circuit pushes the ETD and saves energy by using the concentrate back flow.

The advantage of this system is:

The system produces almost no noise.

No high pressure regulation is needed, the system regulates by itself.

It is a switch On/Off system.

New ceramic parts extend the time between overhaul.

More Water is pumped through the membrane which extends membrane life and increases water quality.

## **2.3 Explanation**

### **High Pressure Gauge (at the ETD)**

The High pressure Gauge shows the operating pressure. The range is between 35 and 55 Bar. That depends of the type of Membrane installed. Generally we are using low energy membranes, so the pressure is about 35-55 Bar.

### **Low pressure Gauge (at the panel)**

The LP Gauge shows the pressure of the Vane Pump. The working pressure is 7-12 Bar.

### **Feed Pump (Vane Pump)**

The feed pump pumps the water to the ETD

### **Flowmeter**

The Flow Meter shows the amount of produced water in LPH

### **Sea Water Filter (Strainer)**

The Strainer is a 60 $\mu$  washable filter and reduces the particles to protect the vane pump.

### **Pre- Filter**

The Pre-Filter is a 5 $\mu$  changeable filter cartridge and protects the Membrane from fine particles.

### **Sample Valve (at the panel) not used on COMPACT Systems**

With the Sample Valve you are able to take a water sample of your product water..

### **Fresh Water Flush System (FWF System)**

The Fresh Water Flush System is a Carbon Filter activated with the valve at the Strainer.  
The Carbon Filter reduces the possible chloride in the ships water system.

### **Clean/Rinse Kit Part Nr. 940**

The Clean-Rinse Kit contains of a Three- way Cleaning Valve and a three Way selector Valve 1.  
If you order the Kit with the unit the valves are already mounted. **In COMPACT systems already installed.**

## 2.4 Quality Monitor (COMPACT Versions)

The Quality Monitor shows the quality of the product water in PPM TDS (Part per Million Total dissolved Solids)

When starting the system the quality is always for a short period ( 30-45sec) high salinity. Shortly the monitor starts to count down. As soon as the quality reaches the pre-set value (factory set point is 600PPM) the water is produced into the tank.



Digital Display ppm  
Switch OFF- AUTO- ON  
Normal position is AUTO.

OFF= Controller is OFF  
AUTO= Controller is in the AUTO position. Automatic product water transfer to tank.  
ON= Product water is always produced into tank.

LED display: RED Controller is OFF  
Amber= Water is produced into tank.  
Green= Water is going over board

Calibrating screw

Set Point for adjusting product water set value. To readjust, push the yellow set button and turn with a tiny screwdriver the desired set point.  
Return- push MEAS

The controller is activating a diversion valve to control the destination of the product water. The diversion Valve is located at the right side of the Main control panel. There is an emergency gray button, to override the valve. Only to be used, when the controller is not working. Push and turn to the right to lock.



## **3.0 Performance**

### **Whisper 90 modular**

Weight: 60 Kg

Power consumption:

Whisper 90 12V - 48A 24V- 24A 230V 4,4A

Product Flow: 90-100 L/h

#### **Operational Parameter:**

Pressure: High Pressure: 600-950psi 40-55 Bar  
Low Pressure: 9-12 Bar

Maximum Salinity: 46000 ppm (ppm= Parts per million)

Temperature Range: 1° C to 45° C

PH – Range: 2 - 11

**The produced fresh water is better than WHO requirement.**

## **4.0 Installation**

### **4.1 Required Material**

- ¼" PVC Hose ( for the product water line )
- ½" PVC Hose ( for the overboard Line )
- ¾" PVC Hose ( for the Sea Water Line )
- ca. 10 hose Cleats (1/2" and ¾" SS )
- Tie-Raps
- 15-25 mm<sup>2</sup> Cable (Option) depends on the length
- Breaker 55 A (Option) Relay (Option)

## **4.2 Preparations for Installation**

**For installation pay attention to the Flow Diagram on Page 16 and 17**

### **Sea Water Filter (Strainer)**

Place the Strainer direct after the Sea Cock. The Strainer has a 60µ washable Filter inside.

At the Strainer is the **Selector Valve** mounted. Here you can select either Sea Water operation or Fresh Water Operation. The lower connection is for Sea Water, the upper connection is for the line from the Carbon Filter (FWF System) or, if installed from the Selector Valve 1 if a Clean/Rinse Kit is installed.

### **Vane Pump. (Feed Pump)**

The outlet of the Strainer has to be connected to the inlet of the vane pump.

Install the Vane Pump at or better below the waterline.

For the first use, fill the Vane pump with water.

### **Pre-Filter**

The Pre-Filter can be installed above the waterline.

### **4.3.1 Feed Pump, Pre- Filter and Hose connections**

The Sea Water feed should be a marine grade Sea Cock, that you can close the Sea Cock individually. The sea water inlet should be a scoop type, that the water is pressed in during cruise.

- Step 1 Connect the Sea Water intake with a re- enforced  $\frac{3}{4}$ " hose to the lower hose barb at the valve at the Strainer. Connect the outlet of the Strainer with the intake of the feed pump, or, if an Air separator is used, to the inlet of the Air Separator, which is on 12/24V Systems the inlet of the attached Boost pump. The outlet of the Air Separator is at the bottom of the housing. The left 8mm Line is to drain over board. The upper connection of the Valve at the Strainer has to be connected with the outlet of the Carbon Filter. (FWF System) The inlet of the Carbon Filter must be connected with your boats pressure water.
- Step 2 Connect the outlet of the Feed Pump with the inlet of the red Pre-Filter. The outlet of the red Filter has to be connected with the Sea Water inlet at the ETD, marked with E. The outlet, marked with S is the drain over board.
- Step 3 From the ETD Low Pressure outlet draw the supplied 10mm John Guest pipe to the Main Panels LP Monitor.

**Note!!**

**All connections past the Feed Pump have to be checked carefully, because there is already a pressure of 7-10 Bar. Tighten the hose cleats carefully and check for leaks by the first use.**  
**Use only hoses capable for 15 Bar pressure**

----- Pre – Filter installation completed -----

## 4.4 Hose Connections to PH Stabilizer (Only COMPACT Models, or Option)

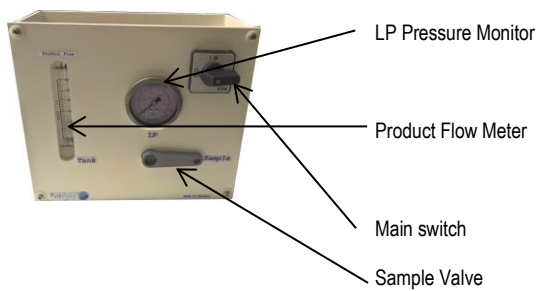
Step 1 The Pre – Filter installation is completed

Step 2 The Product Water outlet at the Manifold has to be connected with the PH Stabilizer.

**Note: The PH Stabilizer is not working as a filter, but as an injector. Therefore the flow is vice versa. OUT is where the line from the Manifold Position Fresh Water must be connected and IN is going to ships fresh water tank.**

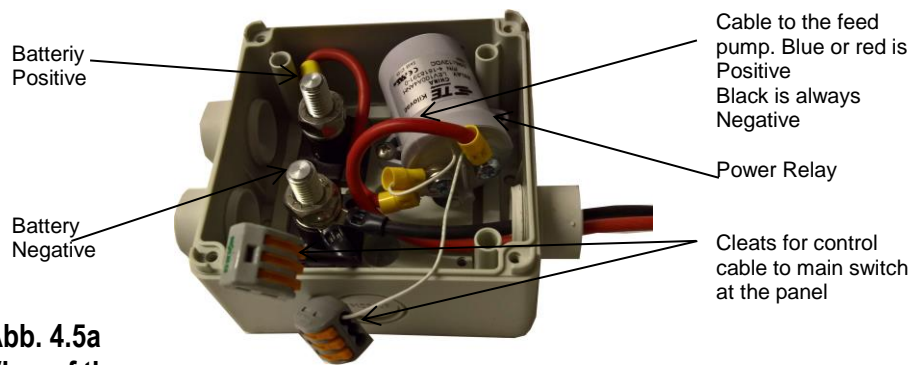
----- Hose Connections completed -----

### 4.4.01 Controls at the front Panel



### 4.4.1 Electrical Control Box with Relay 12/24V DC

**Warning!**  
**Disconnect power from the system.**



**Abb. 4.5a**  
**View of the box**

- Step 1 Disconnect Power
- Step 2 Connect the Battery Positive cable to the 10mm Bolt, marked red.
- Step 3 Connect the negative cable with the not marked Bolt.
- Step 4 The Cable to the Feed Pump is factory connected.
- Step 5. Look into the connection Box of the Motor. The Positive Bolt is marked with a + at the bottom. Use a light to find it out. **Wrong connection of the motor will result in wrong direction turning and the pump rotation is wrong.** Then connect the Feed Pump Cable to its respective side. **COMPACT Models have this connected**
- Step 6. Connect the control cable to the cleats in the control box and connect the other side to the switch at the main panel. **For Units with Air/Oil separator, there are 3 connections: The Boost pump has to be connected with the red cable to BP+ marked cleat and Minus. The Switch at the main panel has to be connected to switch marked cleat and Minus.**

**NOTE!**

If you have a long way from ships Battery to the Motor and Panel, you should order the Control Box Option. (Standard with COMPACT Models) Then you have the possibility to draw Battery cables with 16mm<sup>2</sup> or more to the Motor.

We recommend using the unit with engine running.

----- Electrical Connection completed-----

## **5.0 How to use the system**

### **5.1 Filling and starting the system.**

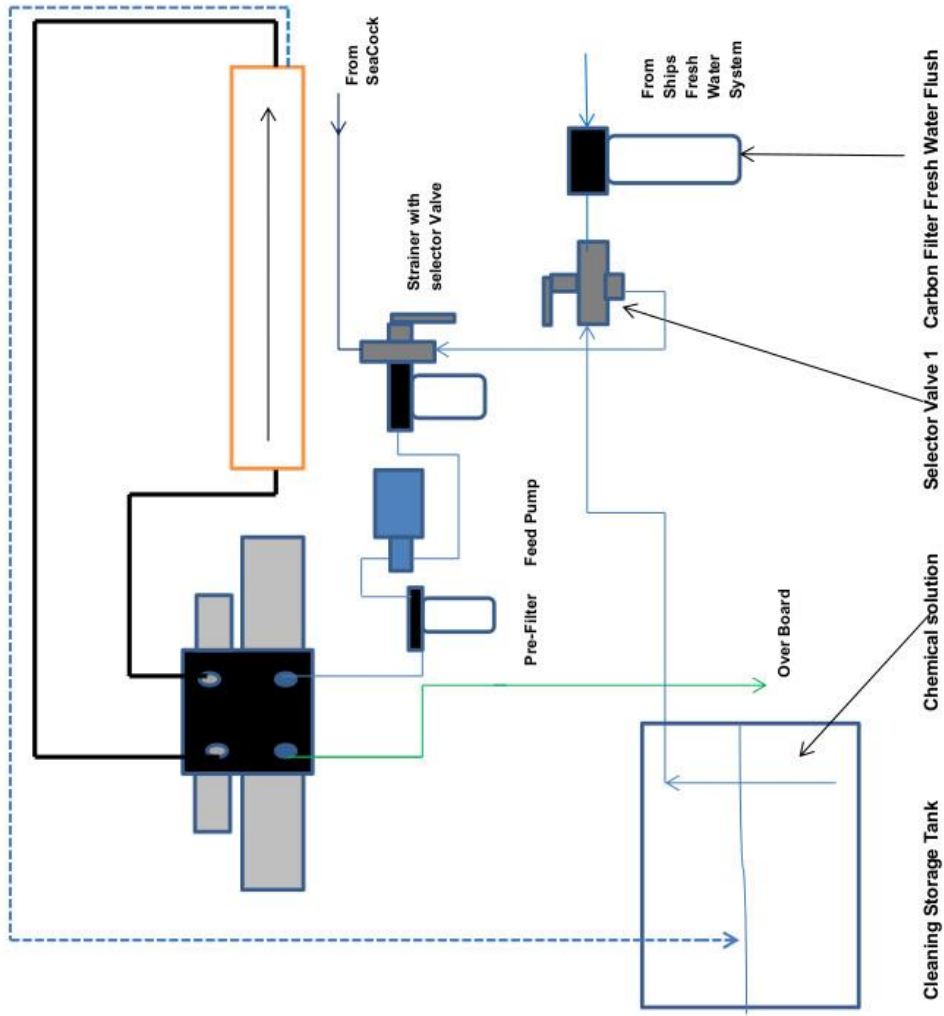
- Step1 Place the Sample Valve in Pos. SAMPLE and guide the hose to a drain. **(Not for COMPACT Models)**
- Step 2 Open the Sea Cock and let water flow into the system. For units with automatic time related fresh water flush system, you have to start the unit.
- Step3 We recommend bleeding the system carefully.
- Step 4 Start the system and open the bleed Valve at the red pre-filter. When water is coming out, close the valve.

**If you don't see water coming out at the overboard outlet within a minute, stop the system and check the position of the valves.**

- Step4 If everything is fine and the overboard brine flow is free of air you can watch the pressure indicators. The low pressure at the panel should read between 8 to 10 Bar and the high pressure Gauge at the ETD should read in normal seawater 35-55 bars. If you test the unit in brackish water the pressure is lower.
- Step 5 **ONLY FOR COMPACT MODELS.** Watch the Quality Monitor. After 1-2 Minutes, the water quality should be below 500 PPM and the system produces water into the tank.
- Step 6 **NOTE!!**  
If you use the system for the first time or you start the system after having done long term storage, drain the product water for about 5 minutes to allow all chemicals drained. (Sample Valve to Pos. Sample)
- Step 7 Check the product water either with a handheld tester (Option) or just taste it.
- Step 8 Check all connections for possible leaks.

**-----The unit is now ready for use -----**

## Flow Diagram Preservation Configuration



### Preservation Configuration

- Sea Water High Pressure
- - - Product Water
- Brine Low Pressure
- Suction Line from Storage Tank

Clean /Rinse kit contains :  
**Cleaning Valve and Selector Valve 1**  
**Standard on COMPACT Models**

## 6.0 Maintenance

### 6.2 Short Term Storage/Fresh Water Flush

Ideally, the SEA STAR Whisper performs optimally when the RO unit is used periodically. However, the Likelihood of bacterial and biological growth in the membranes increases, when stagnant seawater (in extended periods) is in contact with the membranes. A freshwater flush procedure is necessary to prevent clogging and growth of organic contaminants in the RO system and its membranes. This method pushes out older stagnant seawater (saltwater) out of the membranes and replacing it with freshwater (non-saltwater), leaving less chance of fouling the membranes. The freshwater flush procedure should be used when the unit will be placed idle or in "stand by" condition for more than 14 days **OR** idle for seven days in hot, tropical climates. Although they do not attack the membranes or other system components directly, high concentrations of biological matter can block enough of the product water channels to cause a reduction of as much as 40% of the total system capacity.

**PERFORM A FRESHWATER FLUSH TO THE RO UNIT WITH NON-CHLORINATED FRESH WATER ONLY. EXPOSING THE MEMBRANES TO CHLORINATED WATER WILL CAUSE IRREVERSIBLE DAMAGE AND VOID THE RO UNIT WARRANTY. THE FRESHWATER FLUSH SYSTEM USES A CARBON FILTER INLINE BEFORE SYSTEM TO CONSUME THE CHLORINE.**

- Turn the handle at the strainer to Fresh Water Position (Selector Valve) - Handle to the Fresh Water Line. Make sure that the ships pressure water system is ON
- Start the unit.
- Let the system run for app. 10 minutes. At least so long, until the high pressure has dropped.
- Stop the system.
- Place the selector Valve back to Sea Water.
- **Change the pre-filter. Install a new one, because the old filter could contaminate the system.**

Now you can leave the System in Stand-by for 3-4 Months. In very hot climates only one month.



### 6.3 Long Term Storage/Preservation

During periods when the RO unit is to be shut down for an extended period of time, it is necessary to re-flush the unit every three month OR to circulate a preservative solution through the membrane to prevent the growth of biological organisms. Use the following procedure to preserve the RO elements:

**PRESERVATIVE CHEMICAL #3 IS A FOOD GRADE PRESERVATIVE. SEE WARNING LABEL ON SIDE OF PACKAGE AND ADHERE TO ALL SAFETY PRECAUTIONS ON LABEL.**

**NOTE: You should allow your unit's product water to run to drain for the first 30 minutes after preservation.**

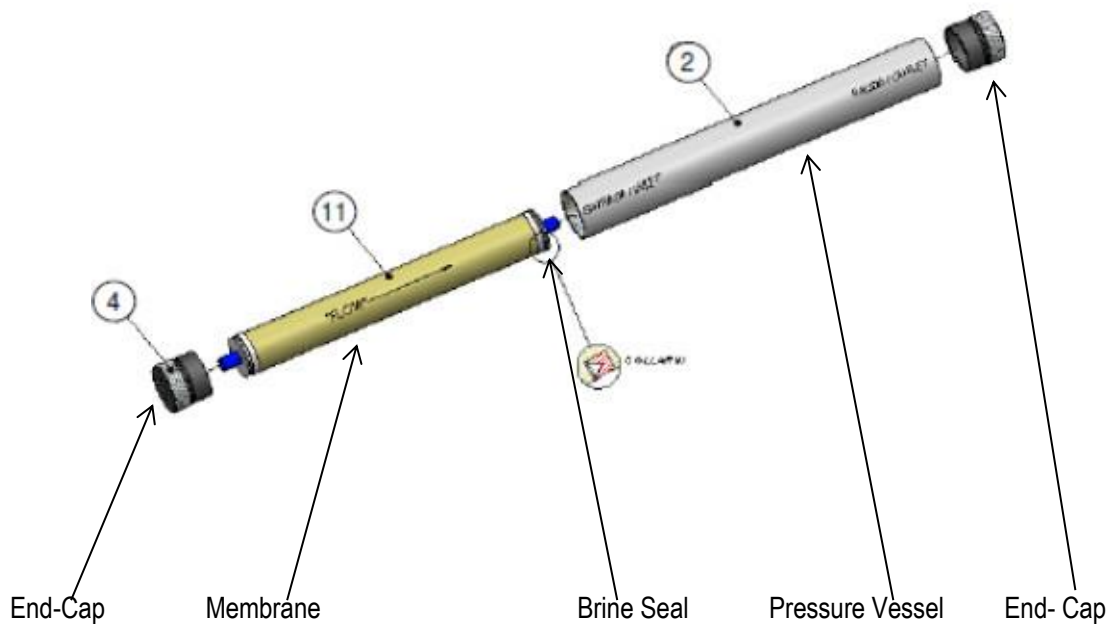
**Pay attention to the Diagram Preservative Configuration on Page 12**

- Step 1 Flush the system with Fresh Water (6.2)
  - Step 2 Place the Sample Valve to pos. Sample and guide the hose to the preservation storage Tank (Bucket) or to drain.
  - Step 3 Place the **Selector Valve 1** to the right. The respective connection should have a hose to the cleaning Storage Tank (Bucket)  
If you don't have the Selector Valve 1 installed, you must draw a hose from the Cleaning storage Tank to the inlet of the pump.
  - Step 4 Mix 4 Tablespoons of Chemical Nr. 3 into the Clean/storage Tank (Bucket) filled with non-chlorinated water. 10 Litres.
  - Step 5 Set the OFF – AUTO – ON switch at the controller to OF.(Only COMPACT Models)
  - Step 6 Start the system until the Bucket is empty.
  - Step 7 Stop the system. It is now preserved.
- Note:** If you have used Sea Water for preservation please repeat the preservation with fresh water as soon as possible.
- Important:** Repeat the preservation procedure annually. Even if you don't use the system you can keep your membrane in a good condition.

### 6.4 Re-Enter Service after Long Term Storage

Before starting the system after a Long Term Storage change the 5µ pre-filter cartridge. You can use the old cartridge for preservation.

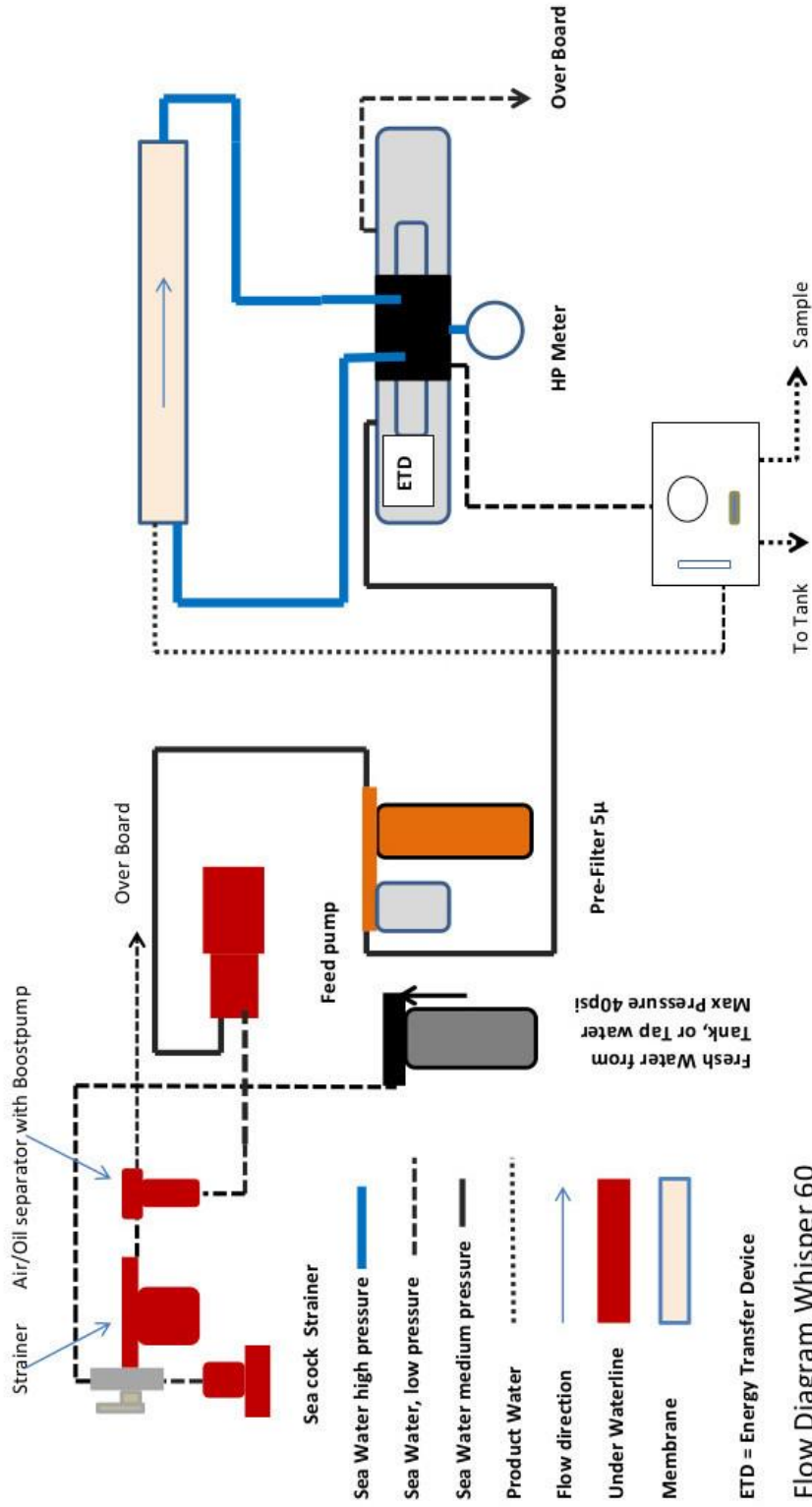
## 6.5 Membrane Replacement



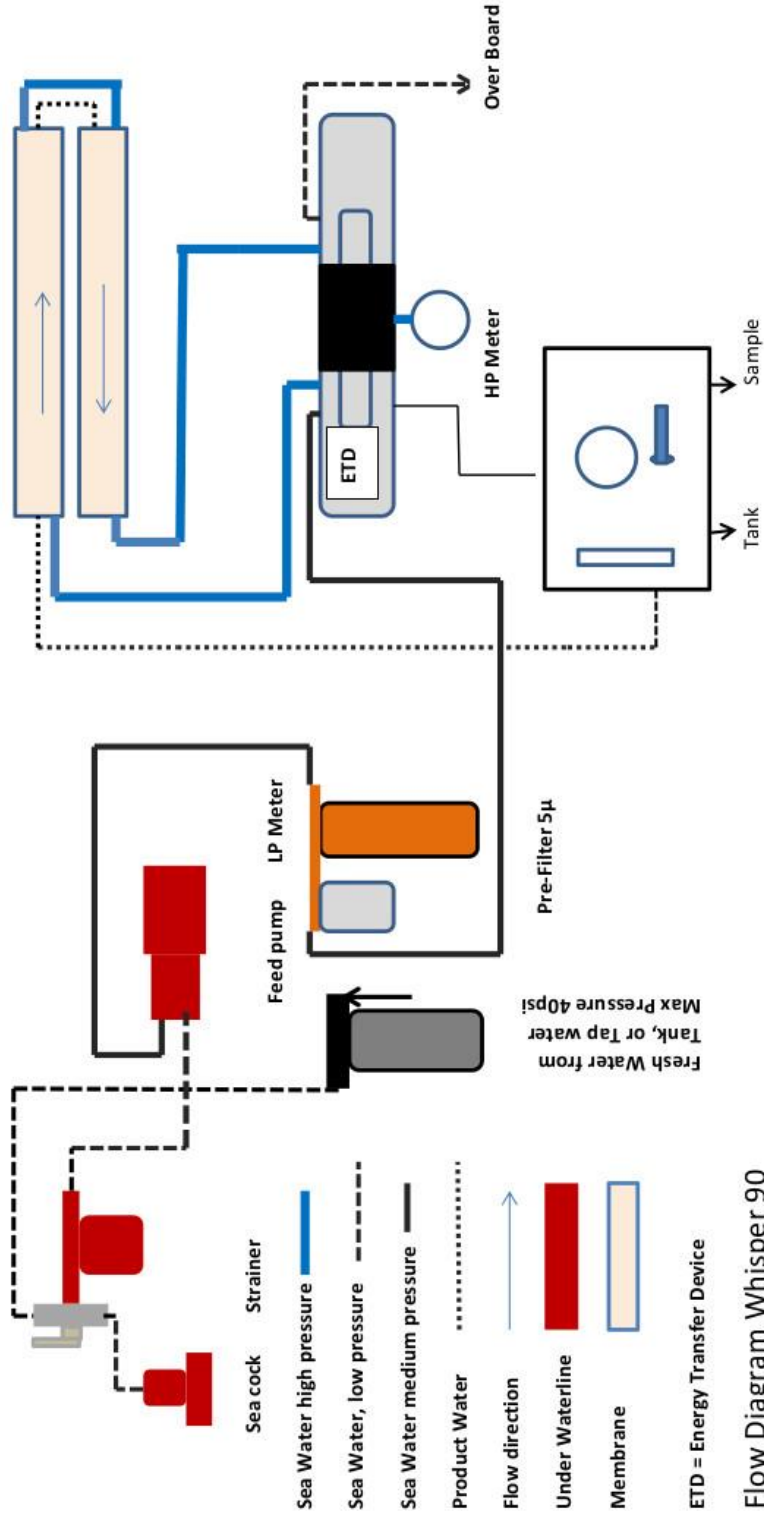
**End-Cap with connections.**

To open the pressure vessels, you need a 5mm face spanner. With that tool you can turn the End-Caps out. Prepare the Membranes Seal in the same position as the old Membrane. Most probably you have to change the seal at the new membrane to the opposite position. All connections should be greased with silicon grease or with Glycerine. Never use any mineral grease which will destroy the membrane. Assemble all back in the same way you took it out. You must hold the pressure vessel vertical to allow the new Membrane to fit into the product water tube.

Flow Diagram with Air/Oil Separator



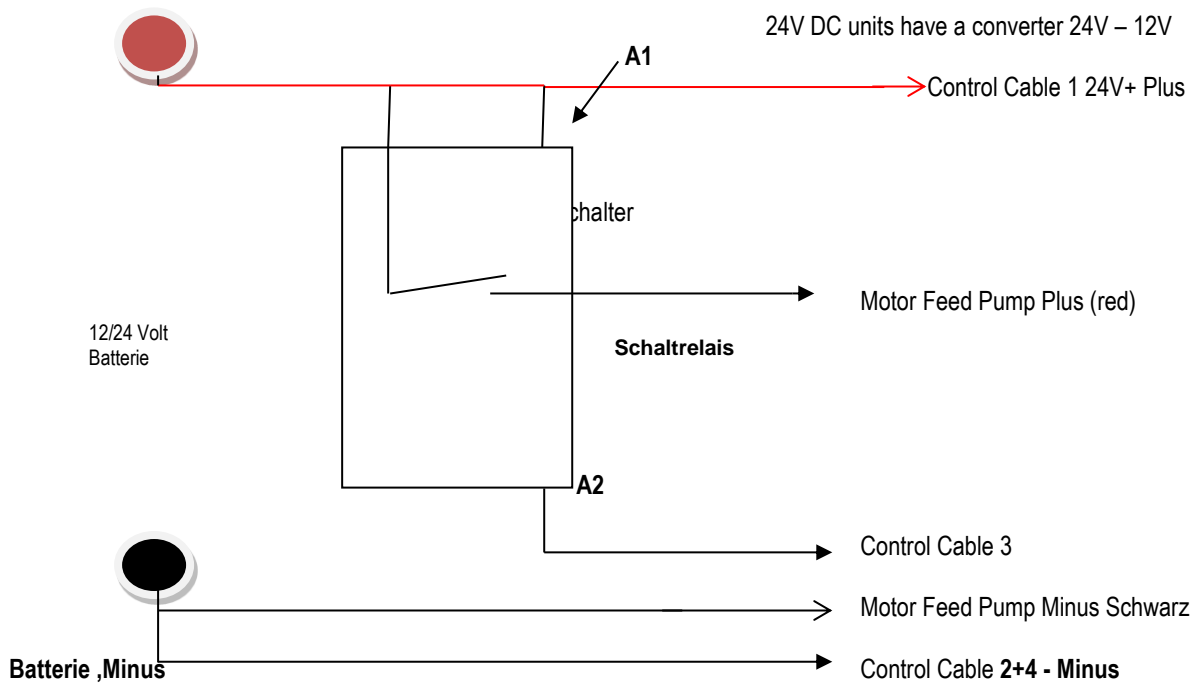
## Flow Diagram Standard Configuration



Flow Diagram Whisper 90  
PureWater- Entsalsungsanlagen

## 8.0 Elektrische Schaltung Wiring

Batterie + ( 10mm Bolzen )



### 8.1.2

#### 12/24V Motor

The 12/24V Motor has a Box on top of the Motor. You have to determine the Positive + connection. There is an embossment of + and – at the bottom. You only can see this if you use a light. **Reverse connection will result in reverse pump rotation direction and can damage the pump. On COMPACT Models it is already connected.**

**A 230V connection should be done by a qualified marine electrician.**

## 9.1 The John Guest System

### How Super Speedfit Works

To make a connection, the tube is simply pushed in by hand; the unique patented John Guest collet locking system then holds the tube firmly in place without deforming it or restricting flow.

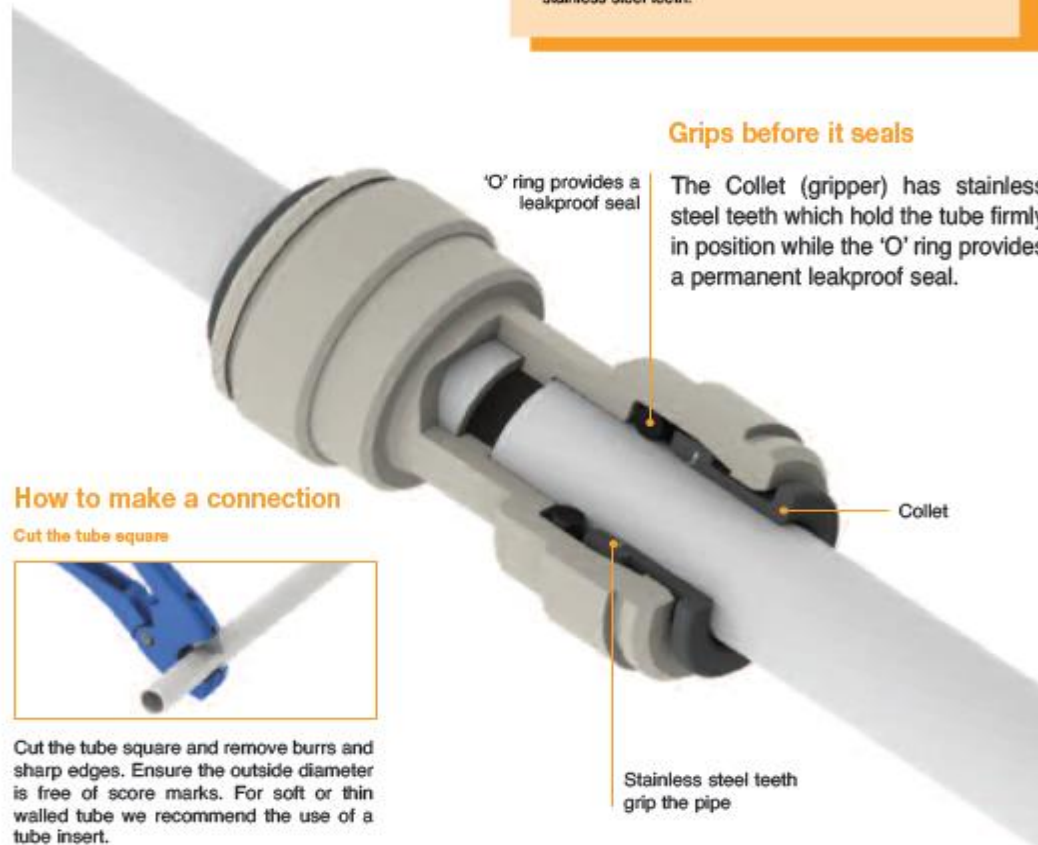
#### Materials of construction

**Super Speedfit** fittings are made up of three components:

**Bodies** are produced in an acetal copolymer or polypropylene.

**'O' rings** are Nitrile rubber or EPDM.

**Collets** are produced in acetal copolymer or polypropylene with stainless steel teeth.



#### Grips before it seals

The Collet (gripper) has stainless steel teeth which hold the tube firmly in position while the 'O' ring provides a permanent leakproof seal.

#### How to make a connection

##### Cut the tube square



Cut the tube square and remove burrs and sharp edges. Ensure the outside diameter is free of score marks. For soft or thin walled tube we recommend the use of a tube insert.

##### Push up to tube stop



Push the tube into the fitting, to the tube stop.

##### Pull to check secure



Pull on the tube to check it is secure. Test the system before use.

#### To disconnect

##### Push in collet and remove tube

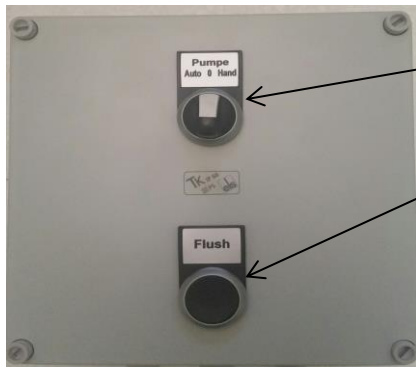


To disconnect, ensure the system is depressurized, push the collet square against the fitting. With the collet held in this position the tube can be removed.

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### 10.2.3 Optional time related flush system

The time related flush system exists of a Valve, a Check valve and a control box. If you have ordered this option, the unit will be controlled by the box.



Switch Pos. 0 = All is off  
 Switch Pos. Hand = Pump is running  
 Switch Pos. AUTO = By pressing the Flush Button the unit starts flushing for the time set and the pump is running.



GND  
 Time Relay  
 PWR L  
 N Common  
 L Pump (phase)  
 N Valve  
 L Valve

