

PureWater



Das Trinkwasser aus dem Meer

Mounting-instruction, User - and maintenance-handbook

for the series NO FRILLS 1000 COMFORT 230 volts 50 Hz and 440/460 V 60HZ



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Your Freshwater-Source

We are happy that you decided in favor of one of our reversion-osmosis-installation (RO unite) and you greet in the growing circle of the users of desalination-installations.

We will do everything in order to satisfy you also after your purchase.

This handbook contains, exact instructions, as you fit in your installation, use it and keep it maintained.

If you should have further questions in addition, you don't hesitate to call us.

In order to gain an optimal performance and a long lifespan of your installation, you read alertly through this handbook before the mounting; if you should require further help, you let it know us.

Index of contents

System-bases.....	1
Performance data.....	2
Membrane-Performance.....	2
Electric connection-values.....	3
Pressure regulation.....	4
Before mounting.	5
Description of the individual parts.	6-7
Mounting the pressure vessels.	8
Motor and pump.	9
Factors affecting Temperature and Pressure.....	10
Flow-diagram.	12 +12a
Pressure Regulator, Product water connection.....	13
Electrical installation.....	14
Connections at the COMFORT Panel.....	14
Starting the System.....	15
Maintenance.....	16
How to Flush.....	17
Cleaning.....	18
Storage.....	19
Influence of pressure and temperature on the performance.....	19
Membrane Change.....	20+21
Wiring.....	22
Logbook.....	23
Quality Monitor.....	24
Push to Flush System.....	25
Pressure Vessel.....	26+27
Parts List.....	28+29
Manufactures Literature.....	30-32
John Guest System.....	33

System-bases

Introduction into the reversion - osmosis

Reverse-osmosis is a process, with which a membrane divides one water-flow in two water flows. One part is fresh-water and amounts about 7-10 percent of the entire water-quantity, the other flow is concentrated saltwater, which is washed away. Since saltwater is a solution of H₂O and different solved materials (salt), the membrane acts like a filter. In order to be able to remove these solved materials from the water, the pores of the membrane must be smaller than the solved materials that should be taken away. The pores of a membrane are so small that they can be seen only by one electron microscope. (0,0001 microns, that means, that the sea-water must be pressed through the membrane. This pressure must have the strength of 800 Psi (56 bar) approximately. How high the current pressure must be exact, is a result from the water-temperature and the salt content of the water.

This temperature / pressure-relationship later will be explained later in this handbook.

See chapters: Temperature - Pressure - Correction.

As you know, each filter can become blocked or damaged. A reverse-osmosis-membrane is no exception. Your System is designed that surplus particles are rinsed with the Brine flow.

Nevertheless, there are conditions, which contaminates, blocked or damage the membrane. With regular maintenance, as it is described in this handbook, the possibility of a failure of a membrane can be minimized and costly substitute be avoided. Regular maintenance is comparatively affordable, gets the effectiveness and extends the lifespan of the installations.

Performance Data

Membrane-performance*

Model	gallons per hour	liter per hour
200 GPD	8,30 GPH	31,41 LPS
400 GPD	16,60 GPH	62,83 LPS
500 GPD	20,80 GPH	78,20 LPS
600 GPD	25,00 GPH	94,50 LPS
800 GPD	38,00 GPH	145,00 LPS
1000 GPD	53,30 GPH	200,00 LPS
1300 GPD	54,20 GPH	205,14 LPS
1800 GPD	75,00 GPH	283,81 LPS
2000 GPD	83,33 GPH	315,40 LPS
3000 GPD	125,00 GPH	473,12 LPS

Salt-Rejection = Minim. 99,2%

Water-quality = above WHO standard

•Sea-water-temperature, pressure and salt content have strong influence on the performance and quality of the product-water. Details you find in the chapter Operation.

Test-conditions

Pressure	800 PSI
Sea-water-temperature	25° C
Salinity	35,000 PPM (parts of million))

Pump-performance

Operating-pressure 700 - 1000 PSI

Total flow

200-800 GPD systems	2,9 GPM
1000-1800 GPD systems	3,5 GPM
1000 Hamburg Süd	3,97 GPM

NO FRILLS 1000 guides

Electric connection-values

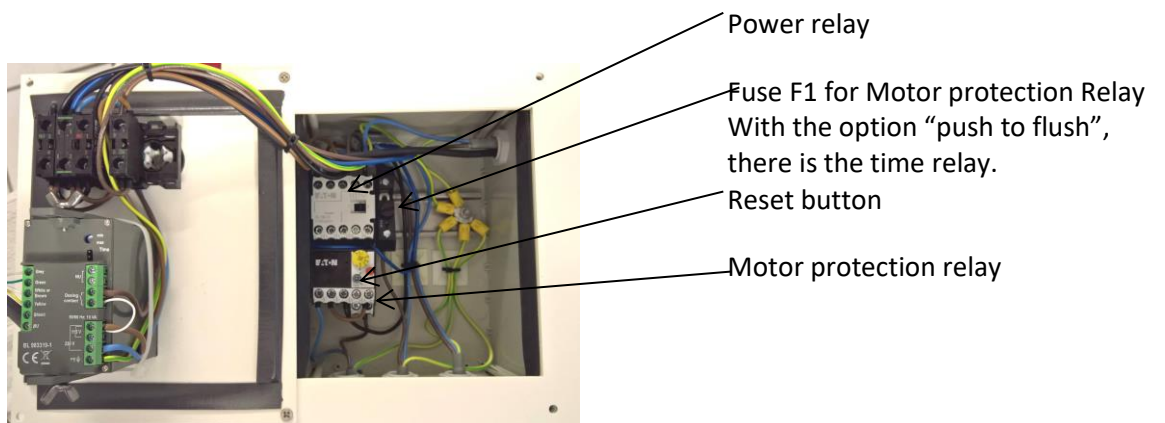
230-volt

SERIES	Ampere	KILOWATT
NO FRILLS 500/600 GPD	7	1,1
NO FRILLS 800/900 GPD	9	1,5
NO FRILLS 1000 GPD	11,4	1,85

Electric wiring

The connection should be carried out by a qualified electrician.

Control box inside:



Motor connection for CAT Pumps

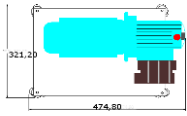
See attached CD

Motor connection for Interpump (Black Motor)

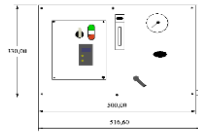
See back side of connection Box

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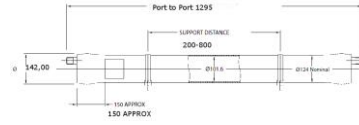
The NO FRILLS 1000 modular COMFORT is delivered in following implementation.



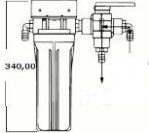
Motor and HP Pump



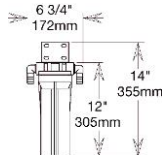
Main Control panel



Pressure Vessel and Membrane NF 1000



Fresh Water flush system

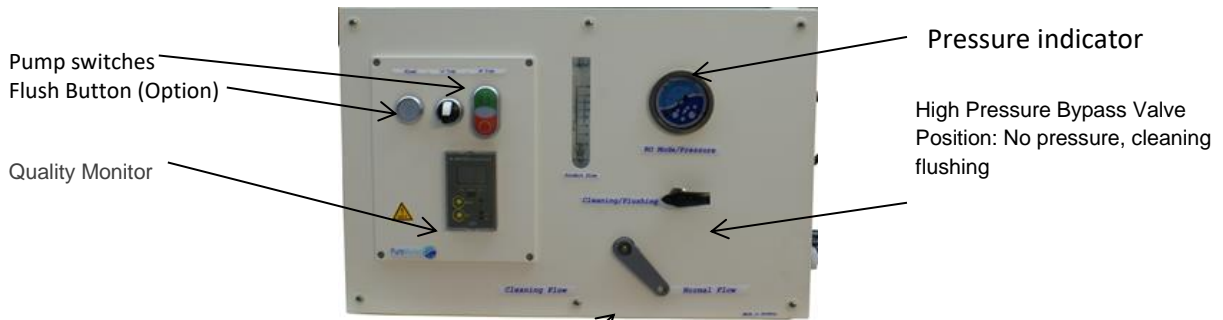


Pre-Filter and PH Stabilizer



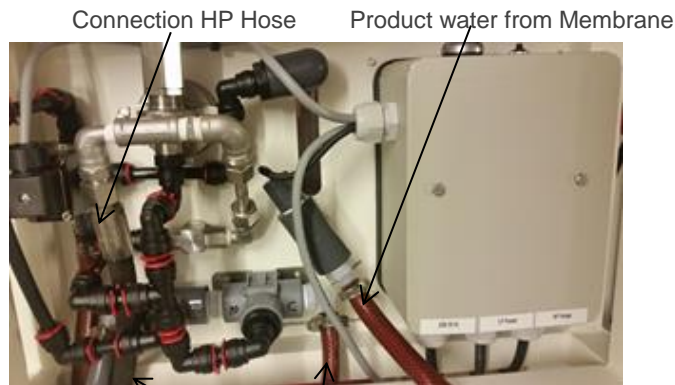
LP Pump N.a.for Hamburg Süd

Pressure Regulation and Flow distribution



CLEANING VALVE: Position: NORMAL FLOW: for desalination and flushing. **Brine Flow over board**. Position: CLEANING: for cleaning and preservation. The flow is returned to the LP PUMP or to the "T" at the FWF system. See flow diagram.

Main Panel Back Side



Product water to PH Stab./Tank Over board return cleaning

Before mounting!!

Please pay attention to the following points before you fit in your NO FRILLS installation and take in operation!

1. The installation should be taken in operation within 12 months after delivery
2. The installation should about every 7 days, in very hot areas, every 3 days, operated with sea water or flushed with fresh-water.
3. If the installation is for a long time out of order, it should at the latest after 12 months flushed and preserved again.
4. Never operate the system in harbors or in areas where fuel and oil is in the sea-water.
5. If you use the system in fresh - or brackish water, the operating-pressure must be adjusted, that the output of fresh water is within the operating limits.
6. Protect the installation from freezing.
7. Don't let the membrane dry out. If you take out the membrane for any reason, it has to be sealed immediately.
8. The sea-water- inlet must be shaped so that the sea-water is pressed in during cruise.

Attention!!

The quantity of the produced drinking water is very strong dependent on the temperature of the sea-water. All accomplishment-statements are based on a temperature of the sea-water of 25°C. Per 1°C under 25°C, the production loses 3 percent of performance.

As well, the salinity of the sea water is a factor. Higher salinity, lower performance.

The general scopes of the NO FRILLS desalination-installations

The NO FRILLS RO systems are laid out according to the last realizations of the reversion-osmosis-technology. These installations enjoy ever more severe popularity with Cruisers, sport-fishers and on boats, where mounting space is limited.

The NO FRILLS are simple to use and uncomplicated in maintenance.

The NF 1000 produces about. 200 liters / h, the NF 800 produces, about. 145 liters / h. See the reduced performance with temperatures under 25°C.

2.2 descriptions of the individual parts

The 230 V boost-pump.

The booster-pump is required to the circulating the sea-water if the high-pressure-pump is built-in at or over the waterline. The booster-pump must be installed below the waterline. The booster-pump supports the start-process, trapped air is fast removed.

Hand-water-test-appliance (Optional) N.A. on COMFORT and COMPACT Models

The hand-water-Tester measures how much ppm of the TDS still is in the water. The value from the World-Health-Organization,WHO, for good drinking water is 500 ppm.

ppm = parts per million TDS (total dissolved Solids)

Pressure gauges

The pressure gauge shows how much pressure the high pressure-pump delivers. The work-area is between 800 and 950 psi.

High pressure-pump

The high pressure-pump pumps waters through the membrane

Flow meter

How much drinking water is produced in the hour shows the flow-meter.

(In U.S. gallons per hour) 1 U.S. Gallon = 3.78 liters. **From July 2015 in L/h**

Pressure Regulator

The pressure control allows the operator to regulate the pressure. 800-850 psi is normal.

Sea-water-filters (option) for BASIC and STANDARD

The sea-water-filter keeps back coarse particles and spares the booster-pump and the pre-filter consequently. **For Hamburg Süd a Plankton Filter is provided.**

Pre-filter

The pre-filter has a permeability of 20/5 microns and filters the fine particles.

Sample Valve (option)

The sample-valve enables to take a water-test directly at the exit of the system. This is to the control the water so that one can prevent the influx of bad water.

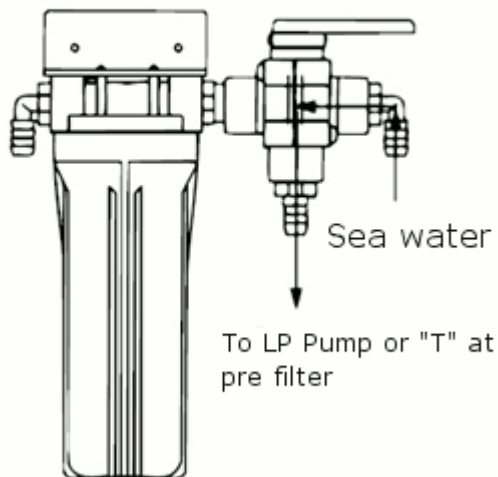
Cleaning-valve (mounted at the pressure regulation)

This valve enables, either a flow over board, or a recirculation for cleaning and preservation. See flow diagram.

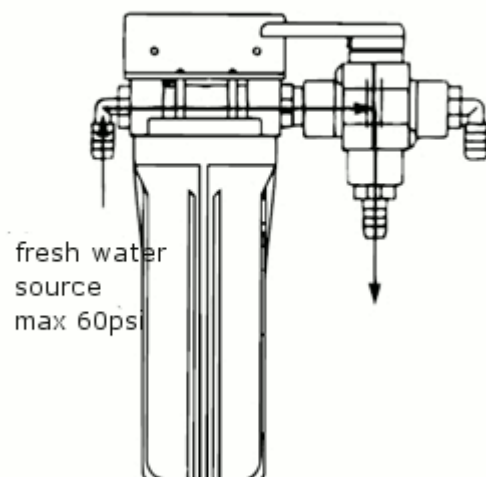
Fresh-water – flush system (FWF)

The fresh-water – flush system provides flushing the system, when not in use, with fresh water, just with a turn of the handle at the selector valve. The build in changeable carbon filter cartridge prevents that chloride comes to the membrane. The handle must be installed below the waterline if you install the system acc. Page 12. When installing acc. Page 12a all components except the boost pump can be mounted over the waterline. Flushing the system extends the lifetime of the membrane and is used for short time storage. (up to 10 days)

POS: Desalination



POS: Fresh water flush



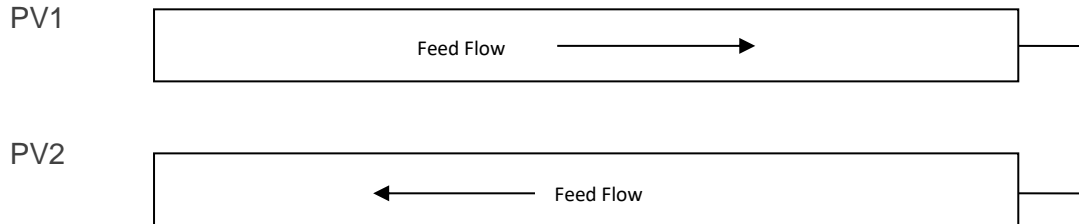
NO FRILLS 500/800/1000 guides

Mounting the pressure vessels

The pressure vessels are individually packed and have to be mounted on the brackets.

All PV (pressure vessels) are marked with an arrow – feed flow direction -.

The PV's are marked also with PV 1 and PV 2.



Connect the high pressure hose from the HP pump with PV 1 at the left side, where the yellow spot is located.

Connect the high pressure hose from the pressure regulation to PV 2, left side, there is **no** yellow spot located.

Connect the short HP hose, delivered in a plastic bag, to the both right HP hose connections at PV 1 and PV 2. See picture above.

Last step is to connect the fresh water hose assy to the both 3/8"/1/2" hose barbs at the PV, right side or left side.

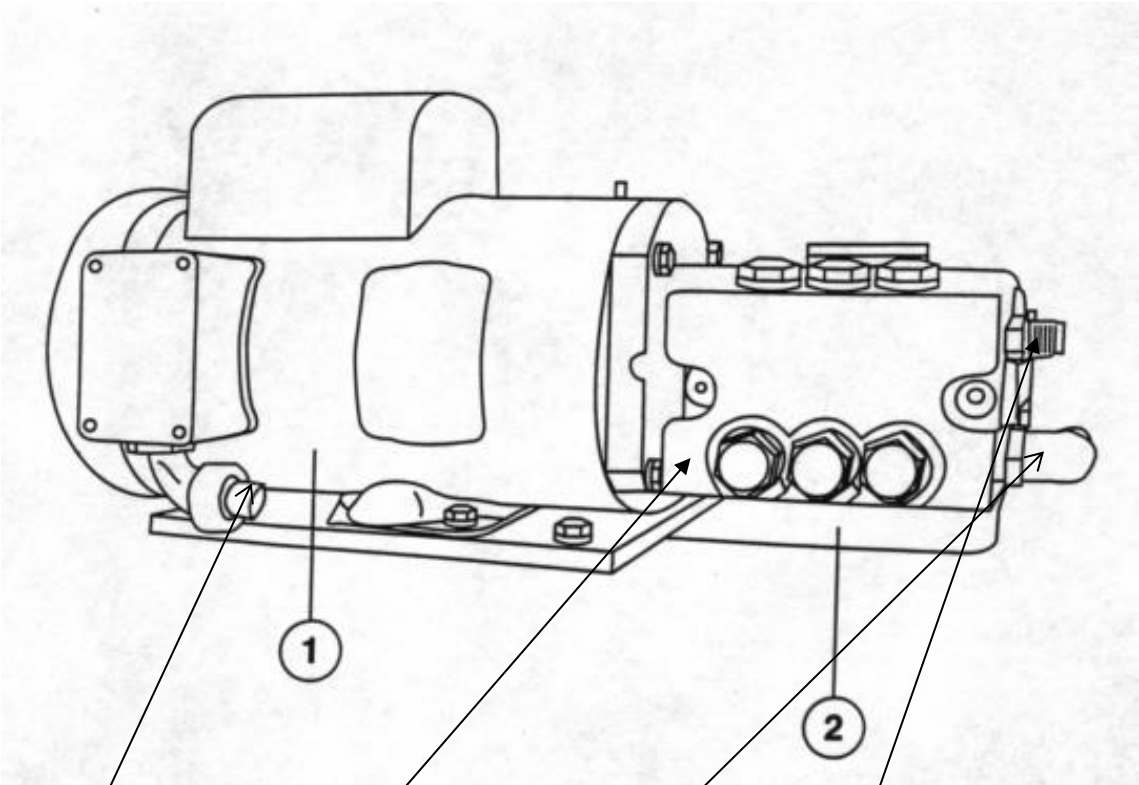
The 4040 Pressure Vessel NF 1000



HP Hose to HP Pump Yellow spot indicates the Sea Water side at this side normally is the product water connection

HP Hose to pressure regulation

Motor and HP Pump



Motor:

See water inlet

High pressure Hose connection

High pressure pump

Attention: Before starting the Pump remove the red oil filler cap and change to the yellow filler indicator, this provides crankcase ventilation.

**FACTORS AFFECTING PERMEATE PRODUCTION
VARIATIONS IN TEMPERATURE, PRESSURE, AND SALINITY**

The following table illustrates how the quality and quantity of permeate produced by a RO system is affected by changes in temperature, salinity and pressure:

With constant	and increasing	TDS	Capacity
Salinity and pressure	Temperature	increasing	increasing
Temperature and pressure	Salinity	increases	decreases
Temperature and salinity	Pressure	decreases	increases

* If the feed water salt concentration decreases, the product water flow rate should not be allowed to increase more than 20% above rated flow. Feed pressure may need to be lowered to maintain rated flow in brackish water or tap water applications.

** Feed pressure shall not be increased above 950 psi.

The RO system can be adjusted to maintain a constant permeate output when feed water temperature and salinity is other than nominal. The operator can do this by controlling system pressure manually via the backpressure regulation valve located in the system brine piping. As permeate flow decreases, the operator can throttle the pressure regulation valve closed to increase system pressure. This, in turn, will increase the permeate output and mitigate the effect of a decrease in temperature or an increase in salinity. Conversely, the operator can open the pressure regulation valve to reduce pressure and permeate flow in areas of excessively high temperature or low salinity.

**IN FRESH OR BRACKISH FEEDWATER CONDITIONS, MAKE SURE TO REDUCE PRESSURE BY TURNING REGULATOR. SET PRESSURE SO, THAT PRODUCT FLOW IS NO MORE THAN 120% OF DESIGNED FLOW; TO PREVENT MEMBRANE DAMAGE.
TEMPERATURE CORRECTION FACTOR**

As previously described, the output capacity of any RO unit is highly dependent on feed water temperature. In order to quantify this relationship, operational data has been utilized to develop Temperature Correction Factors (TCF). The TCF (which is compensated to 25°C/77°F) is used to determine what part of any change in system output flow is due to variations in feed water temperature alone. This, in turn, allows the operator to establish the baseline flow for a given temperature, allowing more accurate troubleshooting. The procedure for calculating the TCF and the temperature compensated flow is as follows:

- 1) Measure raw water temperature.
- 2) Determine the corresponding correction factor from Table 3.2 based on the measured temperature.
- 3) Note the product flow rate at the Product Flow meter.
- 4) Multiply the measure (uncorrected) product flow meter flow rate by the correction factor from Table.

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Example:

Raw water temp: 15°C

TCF: 1.47

Uncorrected product flow: 12.75 (gph)

Calculation: $12.75 \times 1.47 = 18.743$ (gph)

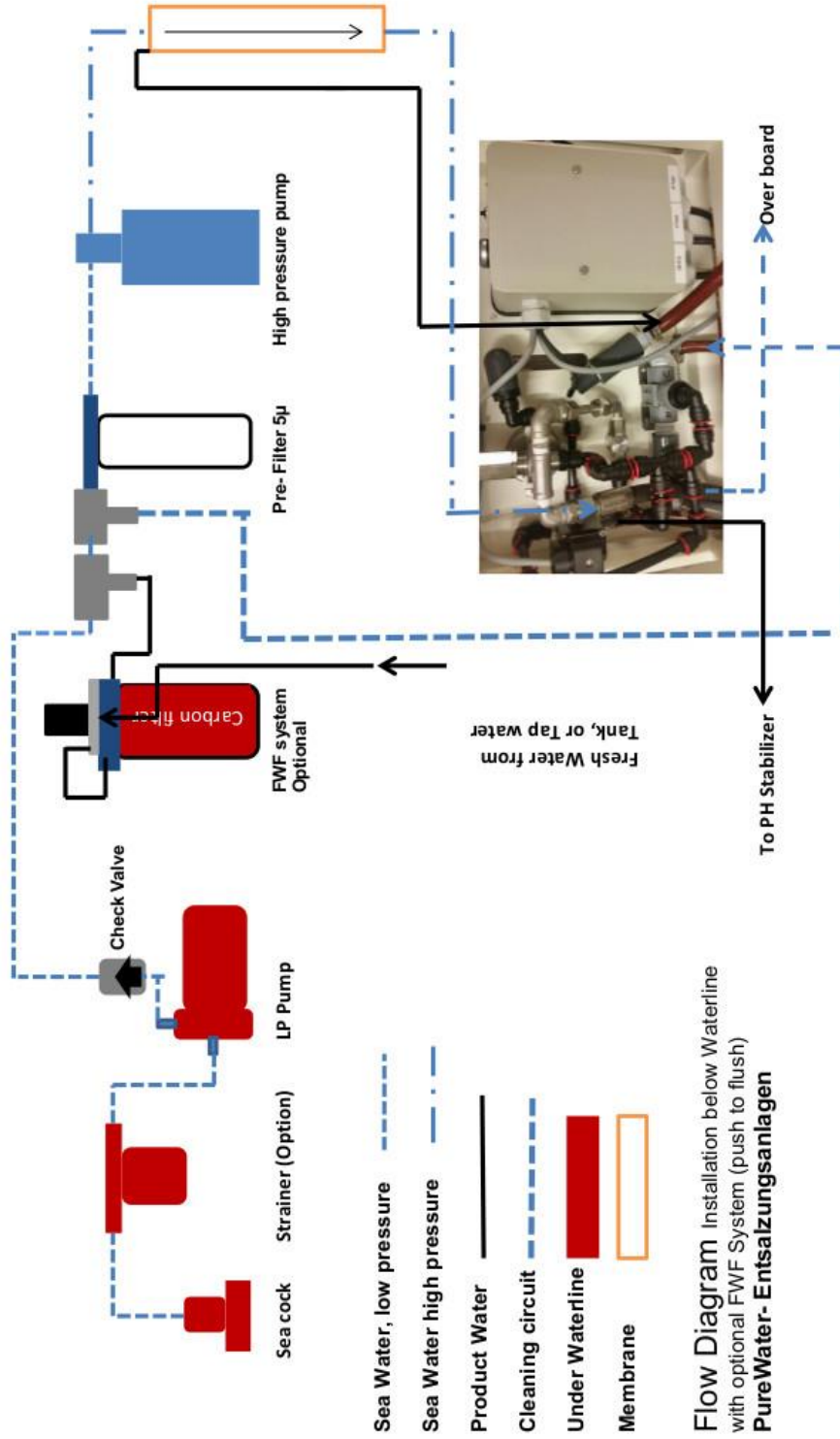
Corrected product flow: 18.7 (gph) This is the normal flow for a NF500

°C	Factor	°C	Factor	°F	Factor	°F	Factor
1	3.64	26	0.97	34	3.47	84	0.88
2	3.23	26	0.94	36	3.18	86	0.82
3	3.03	28	0.91	38	3.18	88	0.79
4	2.78	29	0.88	40	2.68	90	0.79
5	2.58	30	0.85	42	2.47	92	0.77
6	2.38	31	0.83	44	2.29	94	0.75
7	2.22	32	0.80	46	2.14	96	0.73
8	2.11	33	0.77	48	2.01	98	0.70
9	2.00	34	0.75	50	1.88	100	0.68
10	1.89	35	0.73	52	1.77	102	0.65
11	1.78	36	0.71	54	1.68	104	0.63
12	1.68	37	0.69	56	1.59	106	0.61
13	1.61	38	0.67	58	1.51	108	0.59
14	1.54	39	0.65	60	1.44	110	0.57
15	1.47	40	0.63	62	1.38	112	0.55
16	1.39	41	0.61	64	1.30	114	0.53
17	1.34	42	0.60	66	1.24	116	0.51
18	1.29	43	0.58	68	1.17	118	0.49
19	1.24	44	0.56	70	1.12	120	0.47
20	1.19	45	0.54	72	1.08	122	0.45
21	1.15	46	0.53	74	1.05		
22	1.11	47	0.51	76	1.02		
23	1.08	48	0.49	78	1.00		
24	1.04	49	0.47	80	0.93		
25	1.00	50	0.46	82	0.90		

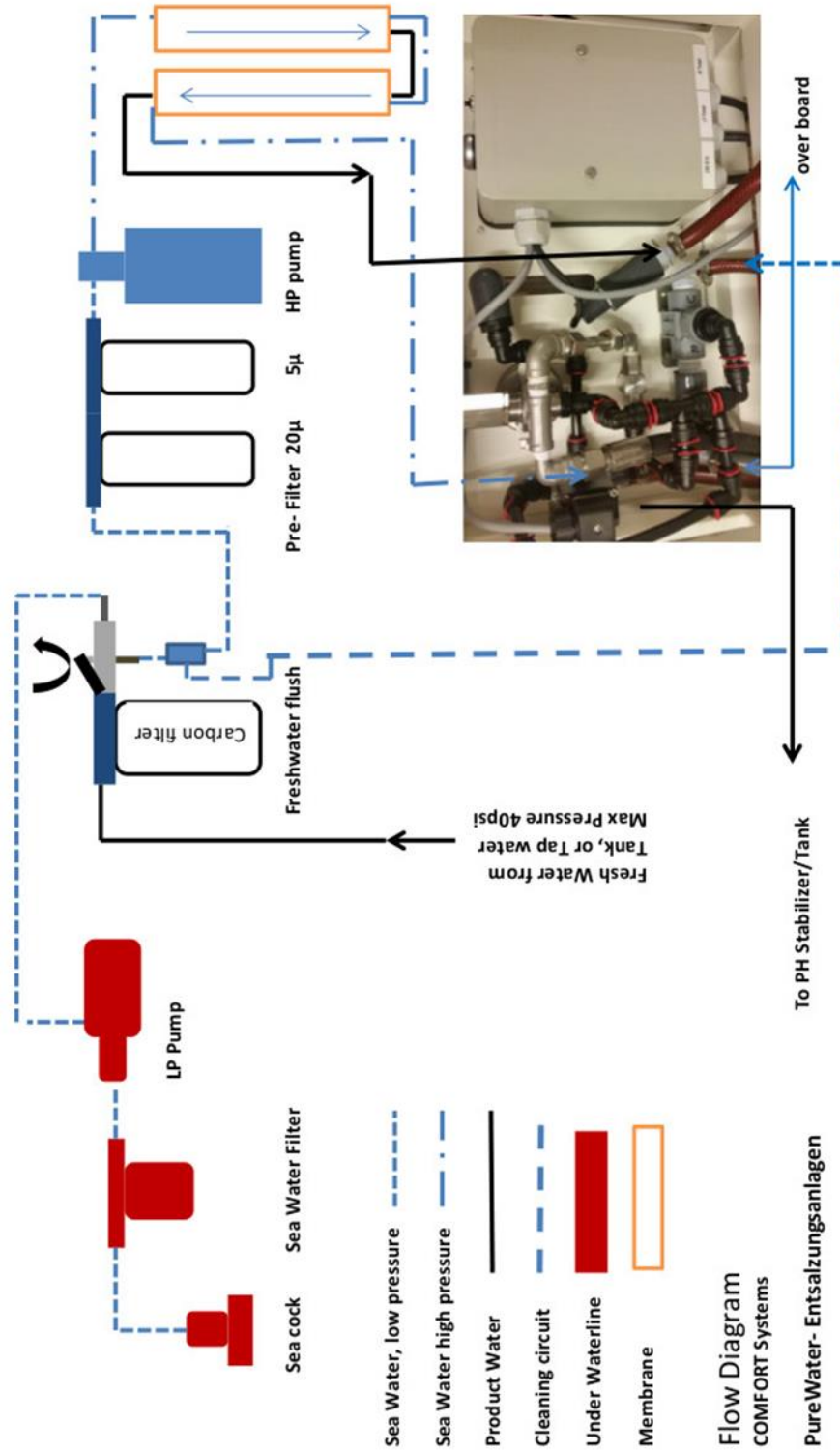
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Flow diagram (Installation above Waterline) with optional “push to flush” system

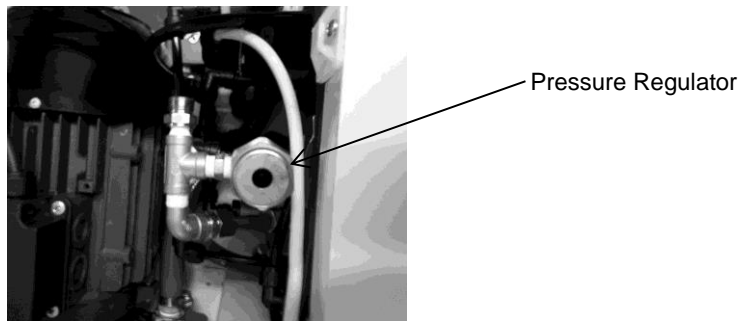


Flow Diagram with manual flush system



Mounting and connections

On the picture below, you see pressure regulator, looking from the top. This could be adjusted with a 27mm key.



Pressure Regulator

The pressure regulator is a fixed set up type; however, it can be adjusted. The regulator is factory set to 800psi (56bar). It might be necessary to adjust. That depends on salinity and temperature. Refer to Temperature and salinity adjustment. But anyhow, the unit will operate with 800psi pressure within the operational limits.

Mounting the system:

Find good positions for the components. Motor and Pumps should be in a dry place. Accessible parts are the pressure regulation, the pre-filters and the fresh water flush system. Keep a little space below the filters for changing the filter elements. Install a seacock in the feed water line.

Mount the system according to the flow diagram. All sea water lines are 3/4" hoses. Don't use transparent hoses. All freshwater hoses are 3/8" or 1/2" We recommend hose qualities which have drinking water grade. Install every part according the flow diagram on Page 12 or 12a.

TO CONNECT THE ELECTRICAL

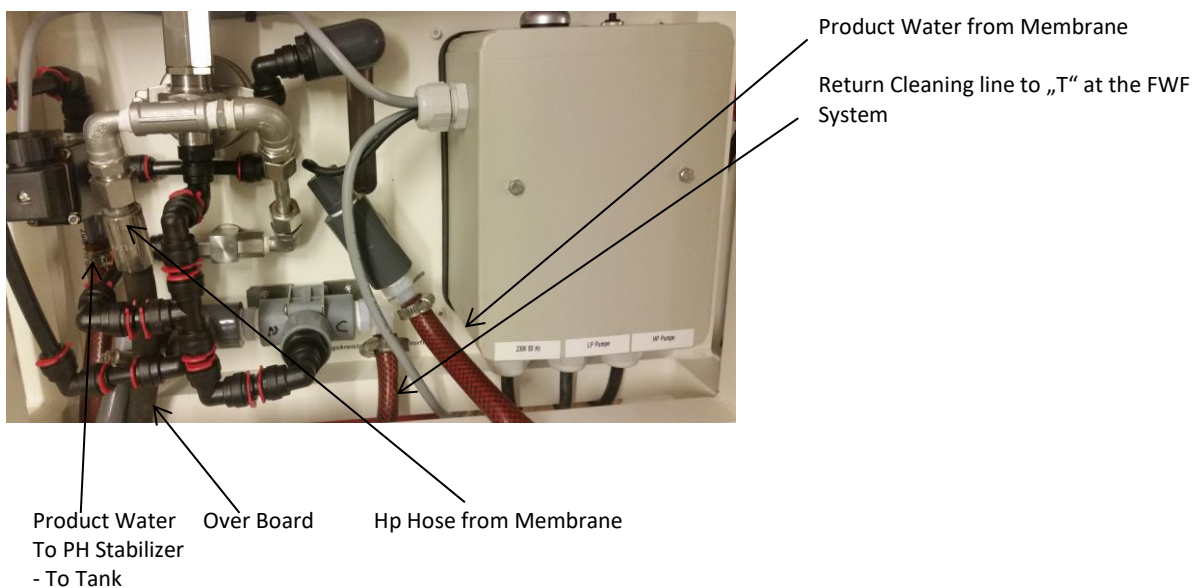
TURN OFF ALL ELECTRICAL POWER FOR USE WITH THE RO UNIT PRIOR TO CONNECTING TO THE RO POWER SOURCE. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH TO PERSONS HANDLING THE UNIT.

NOTE: Adhere to all electrical codes and regulations governing the installation and wiring of electrical equipment. Typical codes specify the type and size of conduit, wire diameter, and class or wire insulation depending upon the amperage and environment.

NOTE: The power supply should always be of greater service rating than the requirements of the RO unit. This will assure proper voltage even if power supply voltage is slightly less than required. Provided is 2,5mm² cable.
Never connect the RO unit to a line that services another electrical device. THE RO UNIT SHOULD HAVE ITS OWN INDEPENDENT POWER SUPPLY.

NOTE: We recommend use of a **15 amp** fuse or circuit breaker for **230 Volts AC** units.

Connections at the COMFORT Panel



All connections are individually marked at the panel.

Starting the System

Step 1: Verify all power switches and power sources are in the **OFF** position.

Step 2: Turn the High Pressure Bypass Valve (Black Valve) to **CLEANING/FLUSHING POSITION**. This procedure allows release of the high pressure air trapped within the system.

Verify the Cleaning Valve (Grey Valve) is positioned to **NORMAL FLOW** discharge. Also check the grey Freshwater Flush Valve is positioned for seawater intake, **NOT** freshwater.

FAILURE TO OPEN THE HIGH PRESSURE BYPASS VALVE, WHICH IS REQUIRED TO RELEASE ANY TRAPPED AIR, COULD RESULT IN HYDRAULIC SHOCK TO THE SYSTEM.

Step 3: Verify the seawater intake is open at the through-hull. This allows the feed seawater to flow into the unit.

Start-up time can be expedited by filling the pre-filter housing with non-chlorinated freshwater, before the RO unit is turned on.

Step 4: Switch **ON** the breaker at main breaker panel to power up unit.

Step 5: Upon start-up inspect all plumbing connections in the unit for leakage. Varying temperatures during shipment may cause plumbing connections to seep when starting the RO unit for the first time. Secure the unit and repair any leaks before proceeding. Once the leaks are repaired, open the raw water source and restart the unit.

Step 6: Observe the Brine Flow over board, to ensure all air and bubbles exited the RO system before proceeding to next step.

Step 7: Gradually turn the High Pressure Bypass Valve (Black Valve) to **PRESSURE** position. The pressure gauge should steadily rise to a reading of 800 psi.

Step 8: Observe the system pressure on the High Pressure Gauge. During RO production, the indicated pressure should be at 800-850 psi.(depending on Seawater temperature) If the pressure reading is not at 800-850 psi, adjust the pressure regulator.

NOTE: If the RO unit is used for other than seawater purification (in freshwater or brackish water applications), reduce pressure as necessary to achieve product flow no greater than 120% of design flow to avoid membrane damage.

RO pressure production should NEVER EXCEED 950 psi, doing so risks damage to RO unit which would VOID factory warranty.

Step 9: Taste the water quality or test it with a hand-held test meter to determine water quality. If quality is good allow the water to flow into the Tank.N.A. for COMFORT and COMPACT systems

Step 10: Check the RO unit for water leakage periodically at the initial start-up. Observe Product Flow meter.

Record the product flow after 48 hours of operation (use the sample log sheet provided).

4.2 TO SHUT DOWN UNIT

Step 1: As the RO unit operates, turn the High Pressure Bypass Valve (Black Valve) to **CLEANING/FLUSHING** Position.(Counter clockwise), when RO unit is running. This will release the high pressure within the RO system.

Step 2: Turn **OFF** your power at the control box.

The RO unit may be left in this “stand by” condition with the seawater for up to seven days or three days in hot, tropical climates. If the RO unit will be out of service for extended time periods, please refer to the Maintenance section of this manual.

MAINTENANCE

The service life of most system equipment is directly related to the raw water inlet conditions. Improper maintenance will also significantly reduce the life expectancy of the major unit components (such as the membranes, filters and pumps) as well as the reliability of the unit as a whole. Under normal conditions, and with proper maintenance, a reverse osmosis membrane (which is the major consumable item) should have an effective service life somewhere between 4 and 6 years.

NOTE: The RO unit must be cleaned when product water output drops by 20%.

Table 5.1: Maintenance Task Chart.

	Daily	Weekly	Monthly	Quarterly	Semi-Annually	Annually	As Required	Labor Hours (approximate)
Clean/inspect micron prefilter			•					0.5
Replace filter(s)*				•				0.5
Clean membranes							•	2.0
Replace Membranes							•	1.0
Check pump oil level			•					0.1
Change pump oil**						•		0.5

 Table 5.1: Maintenance Task Chart.

** Change pump oil after first **100** hours of RO use. After the first oil change at 100 hours, change the pump oil every **500** hours thereafter or once annually which ever interval comes first. The Oil used is a non-synthetic 15W40 Motor oil.

FRESHWATER FLUSH / SHORT TERM STORAGE

Ideally, the No Frills performs optimally when the RO unit is used regularly. 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 several days **OR** idle for three 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 THAT MAY BE PRESENT FROM THE DOCK WATER.

TO FLUSH THE *NO FRILLS* UNIT

- Step 1: Verify all power switches and power sources are turned **OFF**.
- Step 2: Turn **ON** your water pressure and watermaker breakers on main electrical panel. Turn the High Pressure Bypass Valve to **CLEANING/FLUSHING** (ensuring zero pressure in system). Verify the gray Cleaning Valve is positioned to **NORMAL FLOW** position.
- Step 3: Turn the gray Freshwater Flush Valve to **FRESHWATER** position. Handle to Fresh water side.
- Step 4: Turn the switch at the control panel to **ON**
- Step 5: Verify the freshwater supply pressure does not exceed 100 psi.
- Step 6: After flushing the unit for two minutes, turn the switch at the control panel to **OFF** .
- Step 7: Turn the gray Freshwater Flush Valve to **SEAWATER** position. Leave RO unit in standing condition, for up to three weeks. Then re-flush or preserve.
- Step 8: To restart the **NO FRILLS**, refer to instructions: **TO START THE NO FRILLS UNIT**.

CHEMICAL CLEANING PROCEDURE

The RO unit must be chemically cleaned when product water output drops below 80% of original production. The frequency of this occurring will vary greatly upon feed water. Fouling odor from the membrane will naturally occur during regular usage of the RO unit. The fouling odor will progress without proper cleaning of the membranes, therefore reducing the efficiency of the RO unit.

THE USE OF CHEMICALS OR CLEANING METHODS OTHER THAN THOSE OUTLINED IN THIS MANUAL WILL VOID THE RO UNIT WARRANTY. NON-IONIC SURFACTANTS USED FOR MEMBRANE CLEANING OR ANY OTHER CHEMICALS NOT APPROVED IN WRITING BY PUREWATER, WILL VOID THE RO UNIT WARRANTY.

CLEANING CHEMICAL #1 IS AN ALKALINE DETERGENT, USED TO REMOVE OIL, GREASE, BIOLOGICAL MATTER, AND GRIME FROM THE SURFACE OF THE RO MEMBRANES. SEE WARNING LABEL ON SIDE OF PACKAGE AND OBSERVE ALL SAFETY PRECAUTIONS ON LABEL.

CLEANING CHEMICAL #2 IS AN ACID, A MINERAL SCALE REMOVER. SEE WARNING LABEL ON SIDE OF PACKAGE AND OBSERVE ALL SAFETY PRECAUTIONS ON LABEL.

NOTE: All cleaning and preservation procedures can be done with either NON-CHLORINATED freshwater to optimize performance of cleaning process, or see water.

NOTE: You should allow your unit's product water to run and drain for the first 30 minutes after cleaning or upon start up after preservation.

CLEANING STEPS FOR CHEMICAL #1 AND #2

Single Use Cleaning Cartridges

Step1. Prior cleaning the RO perform a fresh water flush to the system. Turn the handle at the freshwater flush system to SEA WATER operation to stop the fresh water flow.

Step2. Remove the 5 micron filter from housing

Step3. Place cleaning filter #1, blue stripe, into filter housing and close it.

Step4. Place High Pressure Bypass valve in Cleaning pos.

Step5. Turn Cleaning Valve in Cleaning Pos.

Step6. Start the RO Unite an let it run for 30 Min.

Step7. Stop the RO system and turn the cleaning valve to NORMAL FLOW. Then flush the system with fresh water.

Step8. Place the Cleaning Filter#2, red ring, into the filter housing and start with Step4 to Step7.

Step9. Place a new 5 micron Filter into the housing.

Powder Form

Step1. Prior cleaning the RO perform a fresh water flush to the system. Turn the handle at the freshwater flush system to SEA WATER operation to stop the fresh water flow.

Step 2. Place 5 TBSP of #1 into the filter housing and fill with clean water.

Step3. Crystals need to be completely dissolved before Proceeding to next step. Screw housing back into place.

Step4. Place High Press. Bypass in Cleaning pos.

Step5. Turn Cleaning valve into cleaning.

Step6. Start the RO Unite and let it run for 30 Min.

Step7. . Stop the RO system and turn the cleaning valve to NORMAL FLOW. Then flush the system with fresh water.

Step8. place 5TBSP of chemical#2 into the filter housing and repeat the Step3 to Step7.

LONG TERM STORAGE / PRESERVATION PROCEDURE

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 weeks 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 cleaning or upon start up after preservation. Use 3 TBSP of NO. 3 Powder.

The procedure is the same than cleaning Step 1 to Step 6. Step 7 is to remove the cleaning filter and leave everything as it is until using the RO system again.

OIL CHANGE PROCEDURE

An oil change is recommended after the first 100 hours of RO use. Subsequent oil changes are to be performed every 500-hour intervals OR changed annually. Change oil any time moisture is detected or if oil is cloudy. For additional pump information, refer to

MANUFACTURER'S LITERATURE

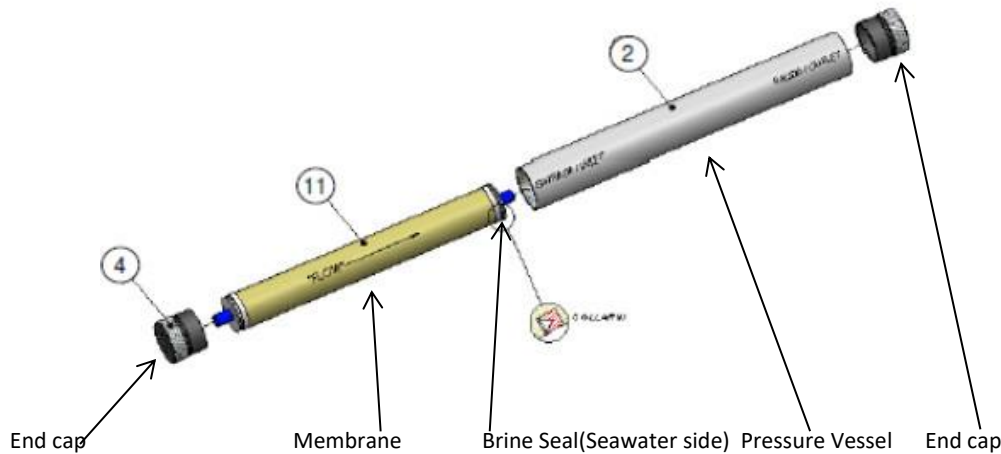
at the back of this manual Or the provided CD

NOTE: The first oil change requires a complete oil drain, to ensure your pump is free of any fragments.

DO NOT RUN PUMP WITHOUT OIL IN THE CRANKCASE.

NOTE: Prior to the oil change, it MAY facilitate the oil replacement process by running the RO unit to heat the oil. Heating the oil reduces the viscosity allowing it to be more fluid to travel through the pump.

Change of Membranes

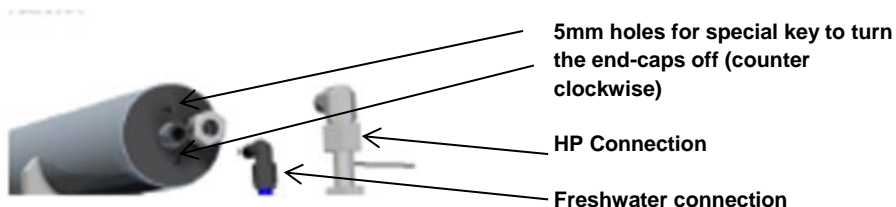


To change the membrane, start on the side, where the sea water is going into the membrane. This is normally the side, where the yellow spot on the PV is located. (Only Phoenix). On PW Vessels, the super Duplex type, locate the feed flow Arrow. At the beginning of the arrow is the seawater side. Turn out the End cap by using a key. Then you can take out the Membrane. The Brine Seal is in the End Cap. Carefully put the End Cap over the Brine Seal of the new Membrane. Use a tiny screwdriver to make sure, that the seal is in the correct position.

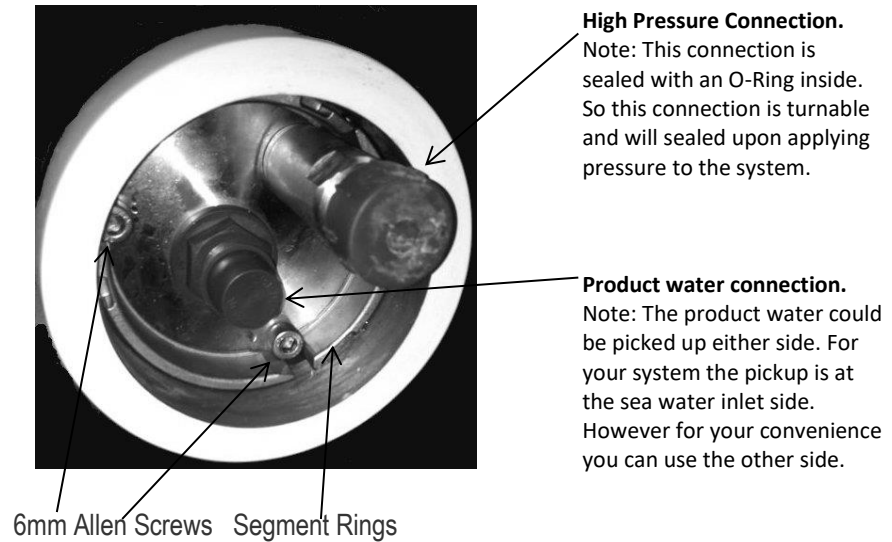
Before installing the new membrane, lubricate everything with SILICON GREASE or Glycerine. Don't use any other lubricant. Any other lubricant will damage the membrane.

Push the new membrane into the PV and push the end cap in position.

PW Super Duplex Pressure Vessels



Membrane Change 4040 Phoenix Pressure Vessels



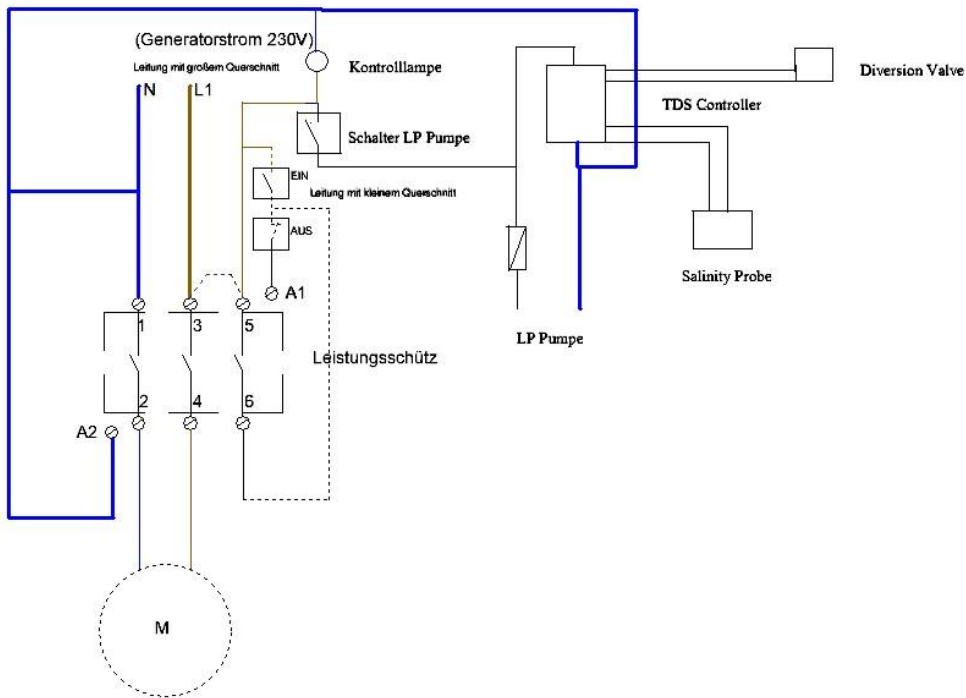
For changing the Membrane, first take out the End Caps of the pressure vessels sea water intake side. This is the side with the yellow spot. Unscrew the Allen screws and take out the segment rings. Then you can pull out the end cap. Normally the cap will come out easy, but after some years of operation you might use various tools to pull them out. Once the cap is out you can see the Membrane inside. Then you can pull out the Membrane. Observe the brine flow seal at the Membrane at the sea water inlet side. The new Membrane has to be in the same position with the brine flow seal at the sea water inlet side. Grease all seals with Silicon Grease or Glycerine. Always hold the pressure vessel vertical when inserting the new Membrane.

Never use any mineral Grease like Vaseline etc. This could damage the Membrane.

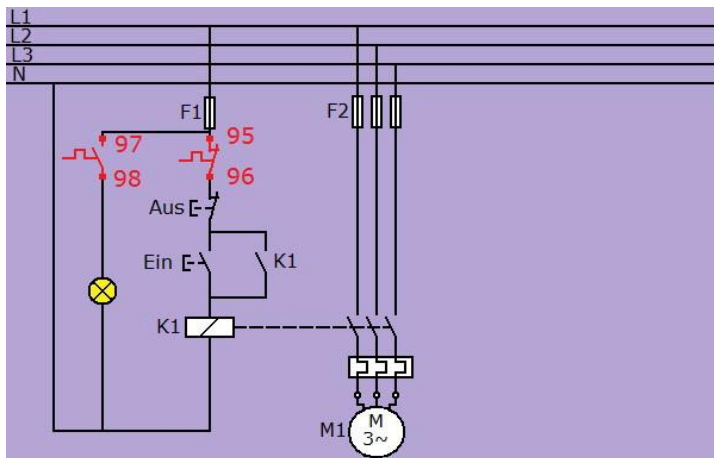
Push the end cap back into the pressure vessel and push the segment rings back into the groove. Last you srew the Allen screws back and the work is done.

NO FRILLS 500/800 Guide

Wiring 1-Phase 230V/50Hz



Wiring 3-Phase 440/460V 50/60Hz.



Logbook

Modell # _____

Manufactures date _____

Sea water temperature

Pressure

Product flow

Salinity Sea water

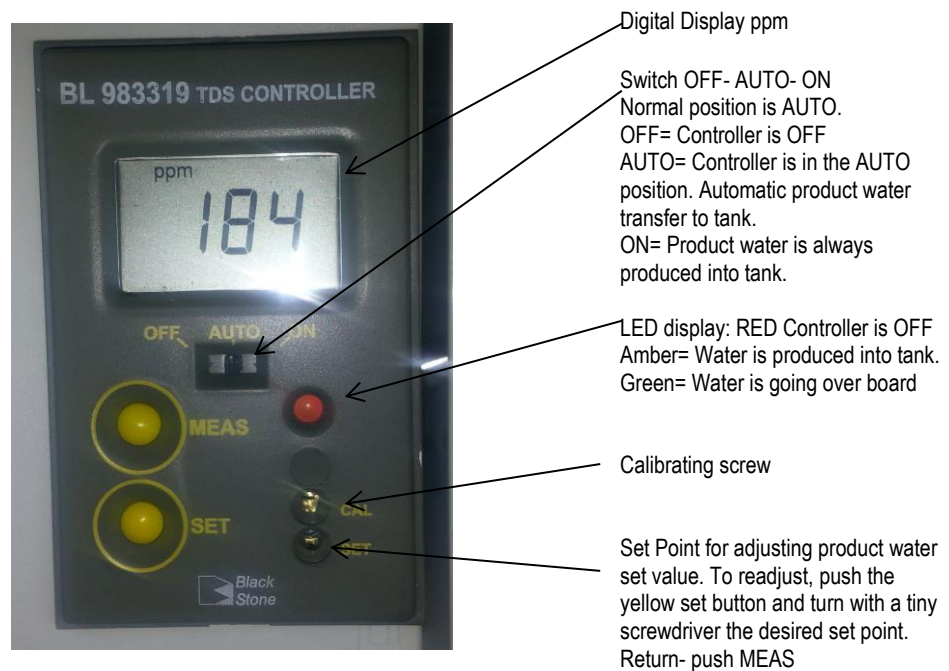
Salinity product water

PH Sea water

Quality Monitor (COMPACT and COMFORT 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 500PPM) the water is produced into the tank.



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.

NO FRILLS 500/800/1000 Guide

Optionales „Push to Flush“ FWF System Part. Nr. 948



When activating the flush button at the main Panel, the system flushes for 6-7 minutes. It starts a flush also, when applying power to the system. During flush operation, the flush button illuminates green.

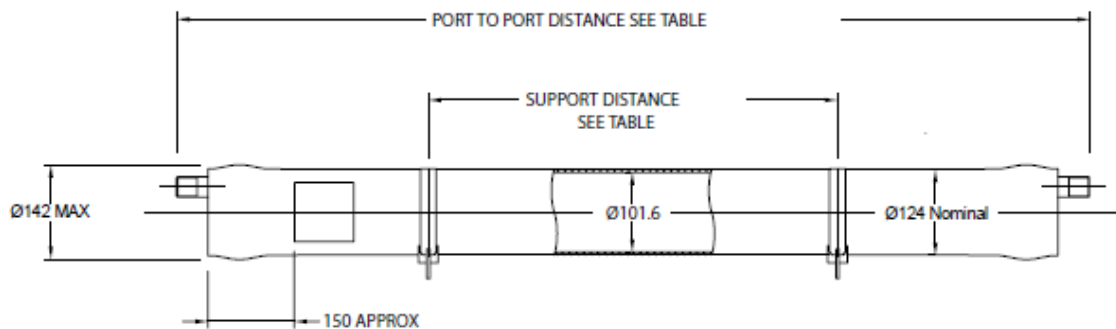
Attention : The fresh water power supply must be on.



Technical Information Sheet

4" End Port Pressure Vessel 1000 psi (69.0 bar)

ORDER REFERENCE
See Box Below



Working Pressure: 1000 psi

Working Temperature: -7° to 45°C

Assembly Drawing: 1MNC 1384

Design Code: ASME X

Body of vessel is manufactured completely from glass reinforced epoxy resins. Pressure vessels can be produced to cover all leading manufacturers membranes regardless of length. Please advise membrane type and length when requesting further details. Please adhere to recommended support positions, if in doubt contact Phoenix Vessel Technology.

Feed and concentrate connections: 3/4" BSP (Male)

Product connections: 1/2" BSP (Male)

Order Reference	No of 40" Elements	Port to Port Length +/-4mm	Max Support Position	Min Support Position	Max Dry Weight
4E1000X.(14)	14"	635	360	150	9.5 kg
4E1000X.(21)	21"	814	540	150	11 kg
4E1000X.1	1	1295	800	200	15 kg
4E1000X.2	2	2413	1810	620	24 kg
4E1000X.3	3	3429	2450c	1310c	33 kg
4E1000X.4	4	4445	2820c	2820c	41 kg
4E1000X.5	5	5461	4650c	3320c	49 kg
4E1000X.6	6	6477	5010c	4340c	57 kg

All dimensions in mm.
All dimensions and weights are nominal unless stated otherwise.

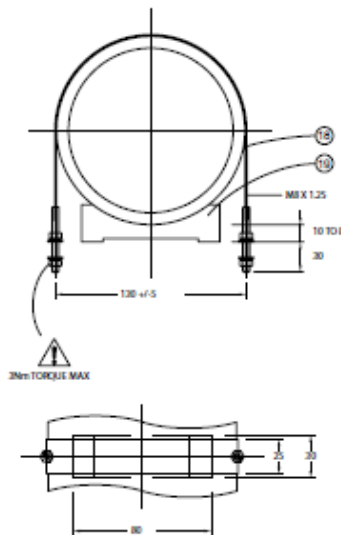
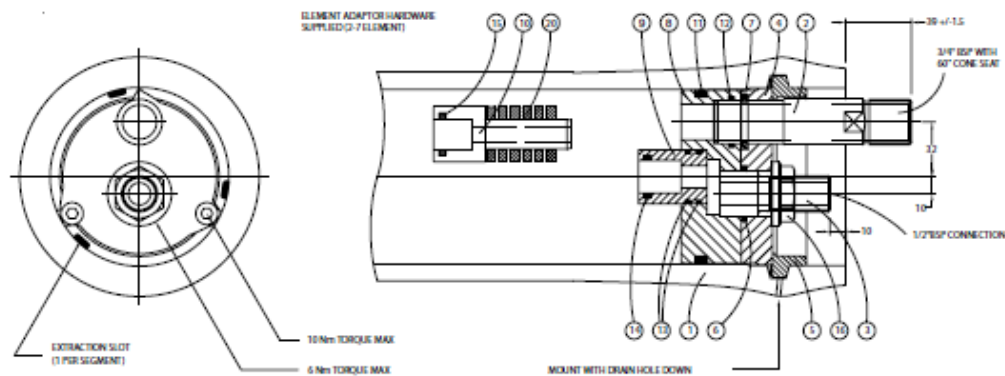
This data sheet supersedes all previous issues.
Product Code: 4E1000X ISSUE:L



Technical Information Sheet

4" End Port Pressure Vessel 1000 psi (69.0 bar)

ORDER REFERENCE
See Box Below



For lubricants and general assembly refer to the **User Guide on our website.**

Item	Description	Material	Part No.	No. off
1	Vessel Body	Glass Fibre Epoxy Resin	BDY 1417	1
2	Feed/Concentrate Port	Duplex Stainless Steel-2507	CMP 1418	2
3	Product Port	Thermoplastic	CMP 2261.A	2
4	Backing Plate	St. Steel 316	CMP 1654	2
5	Retaining Ring Segment	St. Steel 316	CMP 1104	2 Sets of 3
6	'O' Seal (Product Port)	EPDM Included in item 3	BS215	2
7	Retaining Ring (Feed Port)	St. Steel 316	CMP 1299	2 Sets of 2
8	End Plate	Thermoplastic	CMP 1587.A	2
9	Hub	Thermoplastic	To suit membrane	2
10	Adaptor (2 to 7 element)	Thermoplastic	To suit membrane	2
11	'O' Seal (Endplate)	EPDM Included in item 8	BS342	2
12	'O' Seal (Feed Port)	EPDM Included in item 8	BS120	2
13	'O' Seal (Endplate/Hub)	EPDM Included in item 9	BS121	4
14	'O' Seal (Hub/Membrane)	EPDM	To suit membrane	2
15	'O' Seal (Adaptor)	EPDM	To suit membrane	2
16	Backnut 1/2" BSP	Thermoplastic	CMP 1423	2
17	Cap Head Screw	St. Steel A4 Grade	CMP 1077	4
18	Strap	St. Steel/PVC	CMP 3570.A	2/3
19	Saddle	Urethane	CMP 1115	2/3
20	Shim	ABS	CMP 3403	6

DO NOT EXCEED THE MAXIMUM TORQUE.

The company reserves the right to alter specifications without prior notice. This data sheet supersedes all previous issues. Product Code: 4E1000X ISSUE:L

Phoenix Vessel Technology Limited
T: +44 (0) 1452 311673
E: info@phoenixvessel.co.uk

Unit 2, The Old Bakery, Lower Tuffley Lane, Gloucester GL2 5DP
F: +44 (0) 1452 310295
www.phoenixvessel.co.uk



Parts List NF 1000

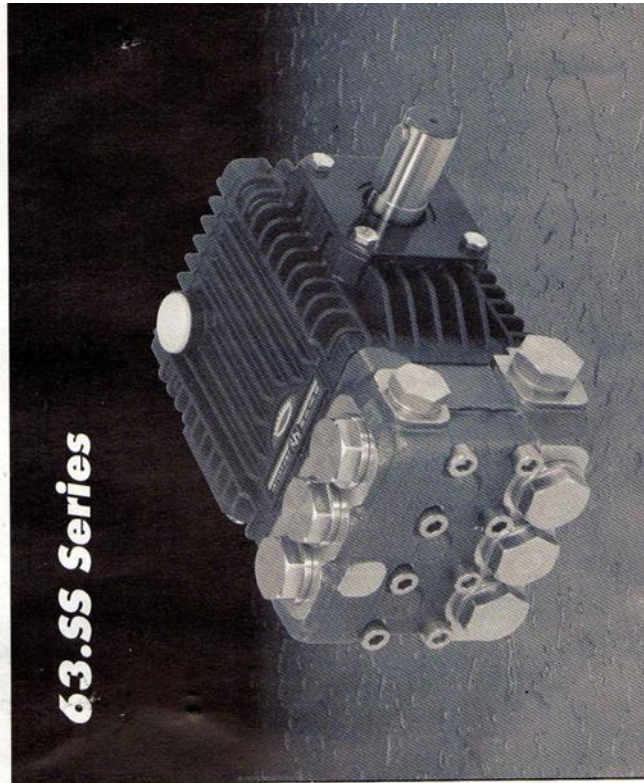
Part	Nr.	Installed Items
Frame assy, white	730	1
Motor and Pump assy 230V/50Hz single phase	218	1
Pressure Vessel and Membrane:		
Pressure Vessel	416	1
Membrane	353	1
Red. 3/4" x 3/8"	667	2
HP conn. 3/8" x 22mm	438	3
Adaptr. 1/2" female x 1/2" female	672	1
Red. 1/2" M x 1/4" female	686	1
HP hose 540mm 22mm elbow	625	2
JG Adapter 1/2" x 10mm	729	1
Pressure regulation:		
Pressure regulation assy.	688	1
Front panel, white	689	1
Manometer PW Logo	227	1
HP Bypass Valve 1/4" F	315	1
Pressure regul. Valve	281	1
Valve cleaning/Normal	435	1
Flowmeter 250 L/h	562	1
Elbow SS 1/4" F x 1/4" F	230	2
Elbow SS 1/4"M x 1/4" F	464	1
Nipple 1/4" x 1/4"	559	3
"T" 316 SS 1/4" F	533	1
Hp conn. 1/4" x 22mm	668	1
HP conn. 1/4" X 16mm	437	2
Tube 10mm assy	691	1
Elbow Nylon 1/2" M x 1/2" HB	335	1
Elbow Nylon 3/4" M x 1/2" HB	202	1
Red. 3/4" M x 1/2" F	692	1
John Guest Parts pressure reg.:		
JG Adapter 1/4" x 8mm	670	2
Elbow 10mm	623	6
"Y" 10mm	693	1
Adapter 1/2" x 10mm	694	1
Elbow 1/2" M x 10mm 90°	695	2
Tube 8mm	696	
Tube 10mm	697	

Parts List NF 1000

Part	Nr.	Installed Items
Electric control box assy	698	1
Boost pump assy	633	1
Dual pre- filter assy	699	1
Fresh water flush assy	23	1
Element filter 20μ	26	1
Element filter 5μ	21	1
Element filter carbon	22	1
PPM Controller assy	644	1
Probe Salinity	581	1
Diversion Valve 230V/60Hz	629	1
Element Plankton	761	1
Element Ph Stabilizer	591	1

NO FRILLS 500/800/1000 Guide

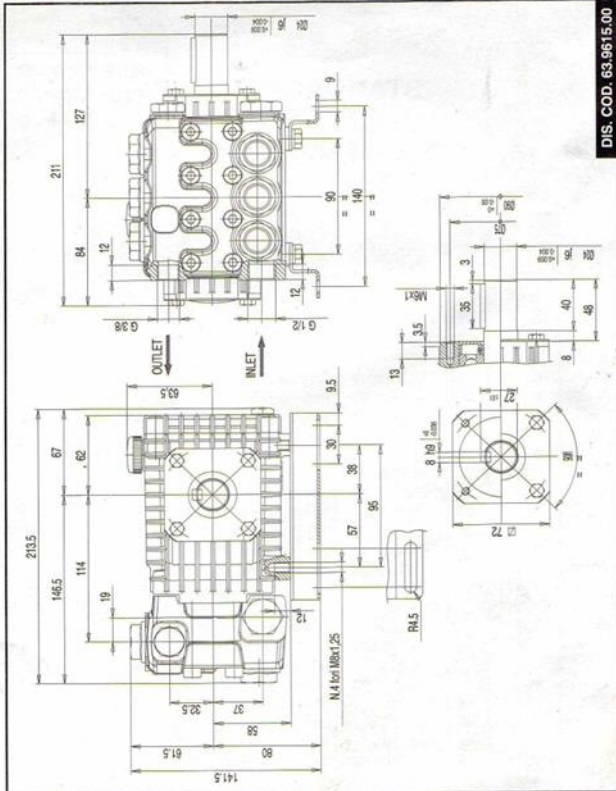
Manufactures Literature



63.55 Series

Pump type	Volume Leistung Debit Caudal Portata		Pressure Druck Pressione Presion Pressione		r.p.m. u.p.m. r/min. g/min.	Required Leistung Puissance Potencia Potenza	Weight Poids Gewicht Peso Peso
	l/min	G.P.M. (USA)	bar	p.s.i.			
SSE1507	7	1.85	150	2175		3 / 2.2	
SSE1509	9	2.38	150	2175		3.5 / 2.57	
SSE1411	11	2.90	140	2030	1450	4 / 2.94	8.5
SSE1413	13	3.43	140	2030		4.8 / 3.52	
SSE1414	14	3.69	140	2030		5.1 / 3.75	
SSU1509	9	2.38	150	2175		3.5 / 2.57	
SSU1511	11	2.90	150	2175	1750	4.5 / 3.3	8.5
SSU1413	13	3.43	138	2000		4.7 / 3.45	
SSU1415	15.2	4.02	138	2000		5.5 / 4.04	

OVERALL DIMENSIONS • ÄUSSERE ABMESSUNGEN • DIMENSIONS TOTALES DIMENSIONES TOTALES • DIMENSIONI D'INGOMBRO



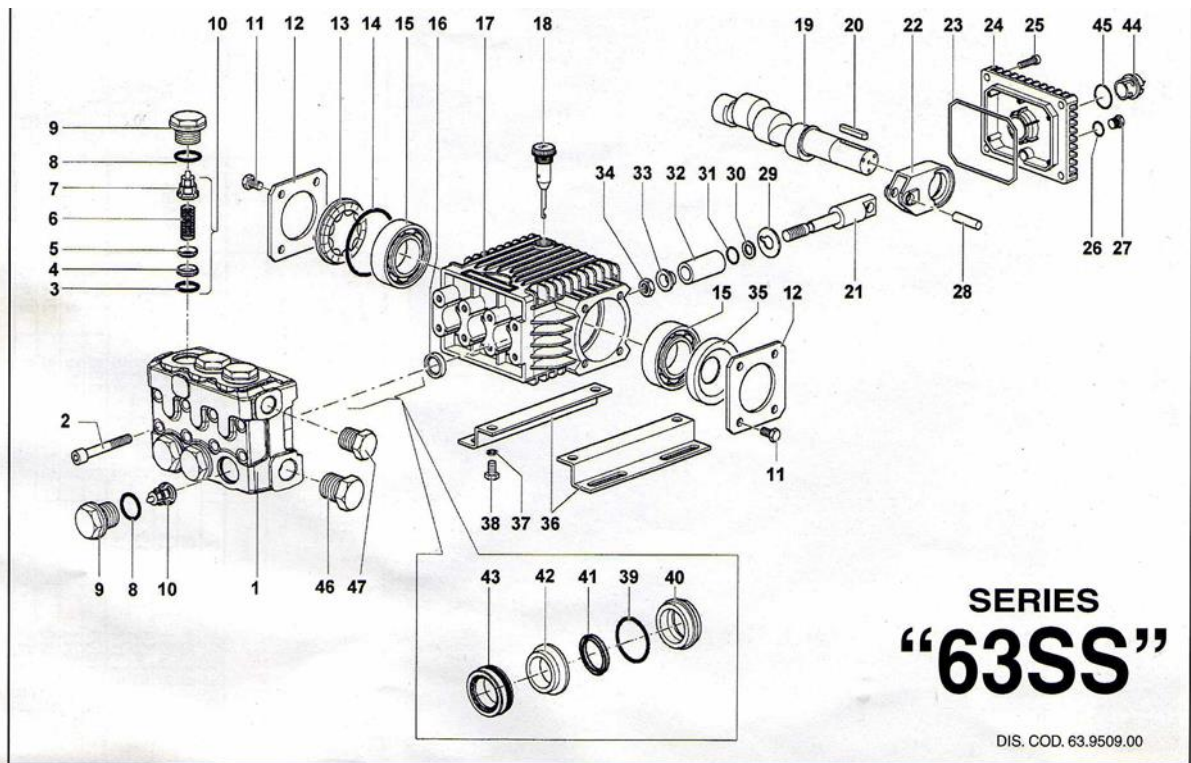
DIS. COD. 63.9615.00

- **LUBRICATION:** Check the oil from time. Change the oil after 50 Hrs. operation and then after every 500 Hrs. We recommend INTERPUMP OIL X-9.9. (SAE 15W40 Mineral) - OIL CAPACITY / 0.4
- **SCHMIERUNG:** Der Ölstand ist in regelmäßigen Abständen zu kontrollieren. Der Ölwechsel muss nach den ersten 50 Arbeitsstunden, in der Folge alle 500 Stunden, vorgenommen werden. Es sollte INTERPUMP OL X-9.9 (SAE 15W40 Mineral) verwendet werden - Ölinhalt 0,4 l.
- **LUBRIFICATION:** Contrôler régulièrement le niveau d'huile. La première vidange doit être faite au bout de 50 heures maximum, ensuite faire une vidange toutes les 500 heures, on conseille huile INTERPUMP X-9.9. (SAE 15W40 Minérale) - CAPACITÉ D'HUILE 0,4 l.
- **LUBRIFICACIÓN:** Controlar periódicamente el nivel del aceite. El cambio del aceite, al comienzo, hay que hacerlo después de 50 horas de trabajo, luego cada 500 horas. Se aconseja aceite INTERPUMP X-9.9. (SAE 15W40 Mineral) - CAPACIDAD 0,4 l.
- **LUBRIFICAZIONE:** Controllare periodicamente il livello dell'olio. Il cambio dell'olio deve essere fatto inizialmente dopo 50 ore di lavoro, successivamente ogni 500 ore. Si consiglia olio INTERPUMP X-9.9. (SAE 15W40 Minerale) - CAPACITÀ OLIO 0,4 l.



Cod. 63.9604.03 - 11/04 - 500

NO FRILLS 500/800/1000 Guide



SERIES "63SS"

DIS. COD. 63.9509.00

PISTON - PISTONE Ø 15

MODEL - MODELLO:
SSE1507 - SSE1509
SSU1509 - SSU1511

PISTON - PISTONE Ø 18

MODEL - MODELLO:
SSE1411 - SSE1413 - SSE1414
SSU1413 - SSU1415

KIT N.	KIT 159	KIT 192	KIT 214		KIT 215		KIT 204		KIT 216	
			Position included	3 - 4 - 5 6 - 7 (10)	41 - 43	39 - 40 41 - 42 43	41 - 43	39 - 40 41 - 42 43		
N. pcs.	3	6	3	1	3	1				

**STANDARD
VERSION
-M-**

SSE 1507 - SSU 1509	
SSE 1509 - SSU 1511	
SSE 1411 - SSU 1413	
SSE 1413 - SSU 1415	
SSE 1414	

POS.	CODE CODICE	DESCRIPTION DESCRIZIONE	N. PCS.
1	63.1216.36	Testata pistone Ø 15 INOX	1
	63.1219.36	Testata pistone Ø 18 INOX	1
2	99.3193.00	Vite M 8x65 UNI 5931 INOX	8
3	90.3841.00	OR Ø 17,13x2,62 (3068)	KIT 192 6
4	36.2036.66	Sede valvola - SS	KIT 192 6
5	36.2001.76	Valvola	KIT 192 6
6	94.7373.00	Molla Ø m. 9,4x14,8 - SS	KIT 192 6
7	36.2025.51	Guida valvola	KIT 192 6
8	90.3847.00	OR Ø 20,24x2,62 (3081)	6
9	98.2229.00	Tappo M 24x1,5x17 INOX	6
10	36.7130.01	Gruppo valvola - SS	KIT 192 6
11	99.1808.00	Vite M 6x10 UNI 5739 - INOX	8
12	63.1500.76	Coperchio laterale carter - INOX	2
13	44.2118.01	Distanziale con indicatore	1
14	90.4097.00	OR Ø 55,56x3,53 (159)	1
15	91.8331.00	Cuscinetto a sfere 6305	2
16	90.1595.00	Anello radiale Ø 18x26x6	KIT 159 1
17	63.0100.22	Carter	1
18	98.2103.00	Tappo carico olio G 3/8	1
	63.0212.65	Albero SSE1507 - SSE1411 - SSU1509 - SSU1413	1
19	63.0216.65	Albero SSE1509 - SSE1413 - SSU1511 - SSU1415	1
	63.0218.65	Albero SSE1414	1
20	91.4892.00	Linguetta	1
21	63.0501.66	Guida pistone - SS	3
22	63.0300.22	Biella	3
23	90.3920.00	OR Ø 101,27x2,62 (3400)	1
24	63.1600.22	Coperchio posteriore carter	1
25	99.1838.00	Vite M 6x14 UNI 5931 - INOX	4

POS.	CODE CODICE	DESCRIPTION DESCRIZIONE	N. PCS.
26	90.3585.00	OR Ø 10,82x1,78 (2043)	1
27	98.2040.00	Tappo G 1/4x9 - INOX	1
28	97.7335.00	Spinotto Ø 9x27,5	3
29	96.7076.00	Rosetta Ø 9x25x0,5 - INOX	3
30	90.5022.00	Anello antiest. Ø 6,2x9x1,5	3
31	90.3573.00	OR Ø 5,28x1,78 (2021)	3
	52.0400.09	Pistone Ø 15	3
32	44.0401.09	Pistone Ø 18	3
33	63.2115.66	Rosetta Ø 8 con collare - INOX	3
34	92.2215.00	Dado M 8 - SS	3
35	90.1641.00	Anello radiale Ø 25x62x10	1
36	50.2000.74	Piedino	2
37	96.7016.00	Rosetta Ø 8,4 UNI 1751 zincata	4
38	99.3037.00	Vite M 8x16 UNI 5739 - 8.8 zincata	4
39	90.3608.00	OR Ø 28,30x1,78 (2112)	KIT 215-216 3
	63.0806.66	Anello di fondo Ø 15 - SS	KIT 215 3
	63.0807.66	Anello di fondo Ø 18 - SS	KIT 216 3
41	90.2150.00	Anello ten. alt. Ø 15x19,5 L.P.	KIT 214-215 3
	90.2200.00	Anello ten. alt. Ø 18x22,5 L.P.	KIT 204-216 3
42	63.2164.66	Anello intermedio Ø 15 - SS	KIT 215 3
	63.2165.66	Anello intermedio Ø 18 - SS	KIT 216 3
	90.2160.00	Anello ten. alt. Ø 15x24x8,5 H.P.	KIT 214-215 3
43	90.2210.00	Anello ten. alt. Ø 18x28x10 H.P.	KIT 204-216 3
44	63.2100.51	Spia livello olio	1
45	90.4051.00	OR Ø 26,58x3,53 (4106)	1
46	98.2180.00	Tappo G 1/2x10 INOX	1
47	98.2100.66	Tappo G 3/8x13 INOX	1

CHART OF COMPATIBLE MINERAL OILS
VERTÄGLICHE MINERAL ÖLE
MARQUES D'HUILES MINÉRALES COMPATIBLES
TABELLA DEGLI OLI MINERALI COMPATIBILI



INTERPUMP	▶▶▶ X-9.9 = ORIGINAL =
AGIP	▶▶▶ F1 SUPERMOTOR OIL
BP	▶▶▶ VISCO 2000
CASTROL	▶▶▶ GTX3 MAGNATEC
ESSO	▶▶▶ UNIFLO
FIAT (FL)	▶▶▶ VS MAX
FINA	▶▶▶ DELTA SUPER
IP	▶▶▶ AZZURRO
MOBIL	▶▶▶ SUPER
Q8	▶▶▶ Q8 FORMULA RALLYE
ROLOIL	▶▶▶ SUPERMULTIGRADE
SHELL	▶▶▶ HELIX SUPER
TEXACO	▶▶▶ HAVOLINE PREMIUM 15W/40
TOTAL	▶▶▶ QUARTZ 4000

≡ SAE 15W40 ≡



- OIL VISCOSITY AT AMBIENT TEMPERATURES FROM +14°F TO +104°F
- ÖLVISKOSITÄT BEI RAUMTEMPERATUREN ZWISCHEN -10°C UND +40°C
- VISCOSITÉ HUILE A TEMPERATURES AMBIANTES ENTRE -10°C ET +40°C
- VISCOSITÀ OLIO CON TEMPERATURA AMBIENTE DA -10°C A + 40°C

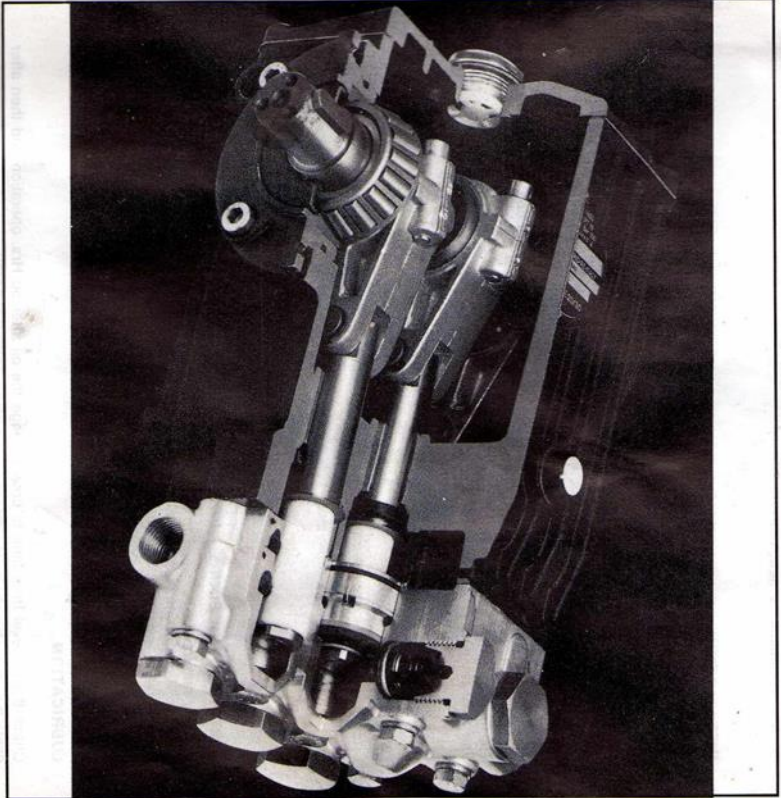
Cod. 31.0072.03 - 12/05 - 50.000 De Pietri

rev. 1

OPERATING INSTRUCTIONS
GEBRAUCHSANWEISUNG
INSTRUCTIONS D'EMPLOI
LIBRETTO D'ISTRUZIONI

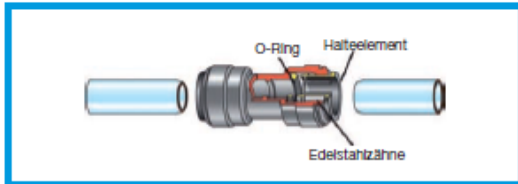


...TWO IMAGES OF A WORLD-LEADER GROUP
...DUE IMMAGINI DI UN GRUPPO LEADER NEL MONDO

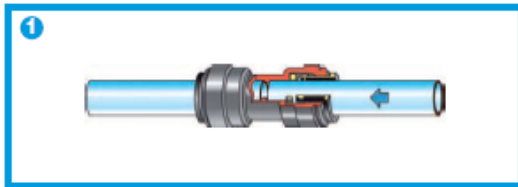
Das John Guest Stecksystem

John Guest Steckverbinder gewähren eine dauerhafte, sichere und dichte Verbindung zwischen Rohr und Verbindungselement. Die Steckverbinder sind ideal in der Anwendung von komplexen Rohrsystemen, sowie in Schulungs- und Testeinrichtungen, in welchen ein häufiges Lösen und Verbinden durchgeführt wird. Durch verschiedene Übergangsmöglichkeiten können bestehende Rohrsysteme problemlos verändert bzw. erneuert werden.

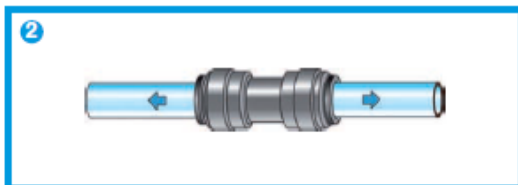
Technik des Ø 4 - Ø 22 mm Systems



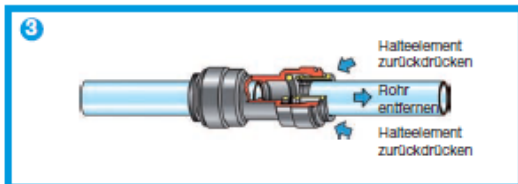
Die Produktreihe PM wird aus Acetalcopolymer (POM) hergestellt und besteht aus dem Verbinderkörper, Halteelementen mit Edelstahlzähnen sowie NBR-O-Ringen zur Abdichtung. Der Verbinder kann ohne den Gebrauch von Werkzeugen sowohl montiert als auch demontiert werden. **Die Verbindung hält bevor sie abdichtet!**



Herstellen der Verbindung des Ø 4 - Ø 22 mm Systems
Rohr rechtwinklig und gratfrei abschneiden und sicherstellen, dass das Rohr keine scharfen Kanten, Längsriefen oder sonstige Beschädigungen aufweist. Das Rohr bis zum Anschlag einstecken. Das Halteelement fixiert das Rohr im Verbinder. Durch den O-Ring wird eine dauerhaft dichte Verbindung hergestellt.

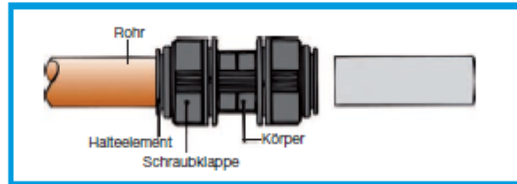


Kontrolle der Verbindung durch Gegenziehen
Überprüfen Sie, ob das Rohr sicher eingesteckt ist. Dies ist durch Gegenziehen leicht möglich.

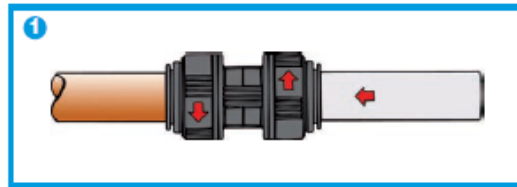


Lösen der Verbindung des Ø 4 - Ø 22 mm Systems
Überprüfen Sie, ob das System drucklos ist. Anschließend kann das Rohr durch Zurückdrücken des Halteelementes gelöst bzw. entfernt werden.

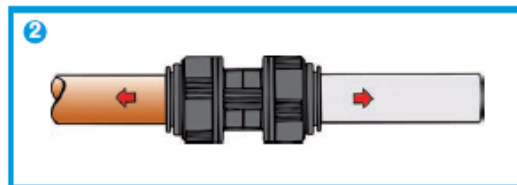
Technik des Ø 28 mm Systems



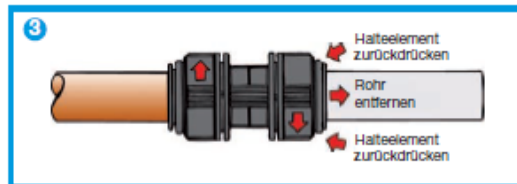
Wie alle Verbinder der Produktreihe PM besteht das 28 mm System ebenfalls aus dem Verbinderkörper, Halteelementen mit Edelstahlzähnen und NBR-O-Ringen. Durch zusätzliche Schraubkappen wird das Haltesystem gesichert und eine Verpressung der O-Ringe auf dem Rohr gewährleistet. Der Verbinder kann ohne den Gebrauch von Werkzeugen sowohl montiert als auch demontiert werden. **Die Verbindung hält, bevor sie abdichtet!**



Herstellen der Verbindung des Ø 28 mm Systems
Wie auch bei den anderen Größen kann hier durch einfaches Einstecken des Rohres eine sichere Verbindung hergestellt werden. Siehe Vorgang links „Herstellen der Verbindung“. Zusätzlich wird durch eine 1/4-Umdrehung der Schraubkappen (2 Klickgeräusche) das Haltesystem gesichert und eine Verpressung der O-Ringe auf der Rohroberfläche gewährleistet.



Kontrolle der Verbindung durch Gegenziehen
Überprüfen Sie, ob das Rohr sicher eingesteckt ist. Dies ist durch Gegenziehen leicht möglich.



Lösen der Verbindung des Ø 28 mm Systems
Um die Rohrsteckverbindung zu lösen, muss die Schraubkappe eine 1/4-Umdrehung entgegen des Uhrzeigersinnes gedreht werden. Nun ist die Verbindung entsichert und kann durch Drücken des Halteelementes gelöst werden. Siehe Vorgang links „Lösen der Verbindung“.