

OPERATION AND MAINTENANCE MANUAL

READY Electron 60



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1. Introduction

1.1 General

Thank you for choosing a **Schenker Watermaker**, and we are sure that the plant will contribute to make your cruises more comfortable and more pleasant.

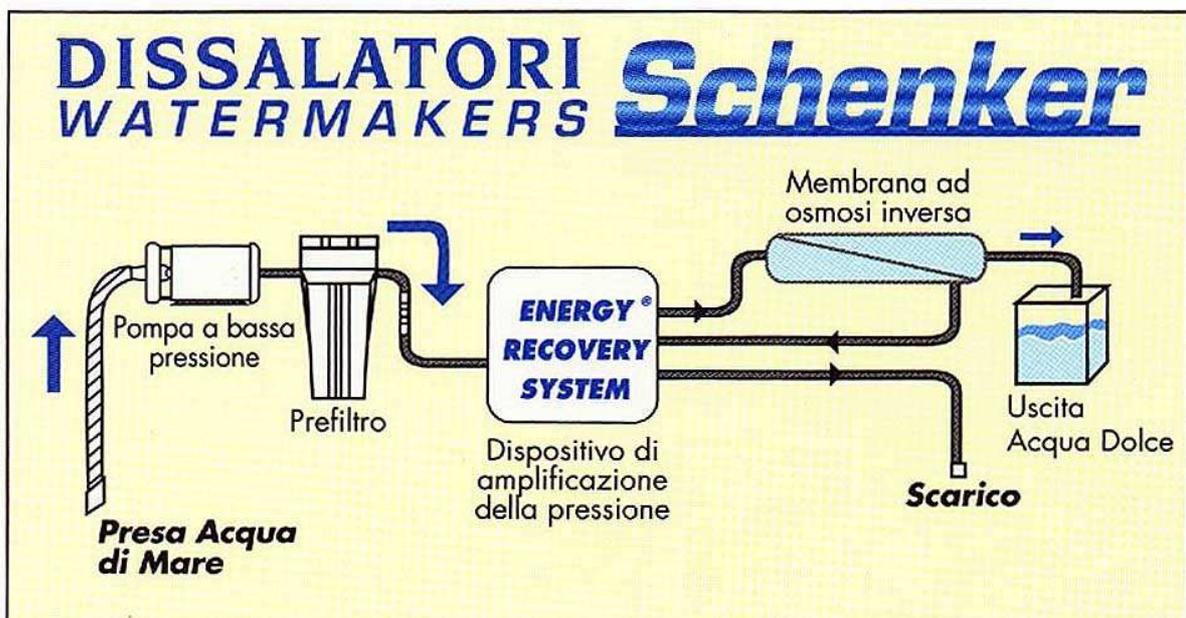
As all the equipment aboard, the knowledge of operating and maintenance procedures allows to use the system in the best way, and to guarantee a perfect functioning throughout the years.

We invite you to read carefully this manual and to keep it aboard for a quick reference.

The **Modular** plant, as alternative to the high pressure pumps of traditional plants, utilizes the **ENERGY RECOVERY SYSTEM** patented device, which amplifies the pressure of common low pressure pumps, and recoup all the hydraulic energy back from the membranes, allowing an high energy efficiency and the possibility to supply the watermaker directly from the batteries. The **ENERGY RECOVERY SYSTEM** operating components are reduced to the minimum, thanks to 2 international patented solutions that eliminate the necessity of pilot valves.

The lack of high-pressure pumps makes the system silent and vibrations free, and enormously simplify the use because no adjustment is necessary for its operating.

Another great system feature is the operating flexibility; the watermaker is in fact equipped with two independent pumps, allowing the regulation of water production according to own needs. A 30 liter/hour water production can be obtained by starting just one pump, consuming only 100 Watt, starting instead two pumps a 60 liters/hour water production can be obtained with a consumption of 240 Watt.



1. Introduction

1.2 Technical data

Dimensions

Length: 85 cm

Width: 35 cm

Height: 31 cm

Net weight: 38 Kgs

Connections:

Seawater intake holder for hose int. diam. 16 mm.

Salt water outlet holder for hose int. diam. 16 mm.

Washing fresh water inlet holder for hose int. diam. 16 mm.

Fresh water outlet compression fitting for hose int. diam. 6 mm. int. X 8 mm. External

Filter : height : 5 “ - 5 microns

Power supply: 12 Vdc +/- 15% (version 60R12)

24 Vdc +/- 15% (version 60R24)

Power consumption: average 250 watt

Production performance: 60 Lit/h +/- 20% @ seawater 25 °C - salinity 35.000 ppm

Quality of water produced: average of 400 ppm TDS

CEE conformity: In compliance with directives 89/392 CEE sect.1 (general safety machines requirements) , 89/336 CEE (electromagnetic compatibility).

1. Introduction

1.3 System description

The Ready system comprises the following main components:

Electric pumps : The pumps are diaphragm type. They pick-up the sea water up and send it to the Energy Recovery System (the pressure intensifier). The working pressure is about 7,5 – 8 Bar. The pumps are fitted with a safety cut off switch, calibrated at about 9 Bar. The pressure switch can be adjusted by an 2 mm. allen key. To make the allen key adjustment to the pressure switch, the black plug of the device must be removed. This gives access to make an adjustment by inserting the allen key. Turning the allen key clockwise increases the preset pressure, and turning anti clockwise decreases the preset pressure. The movement required is very small. (1/4 turn = 1 BAR).

This action will not be required in normal circumstances as the unit has been pre calibrated at the factory.



Accumulator

Filter

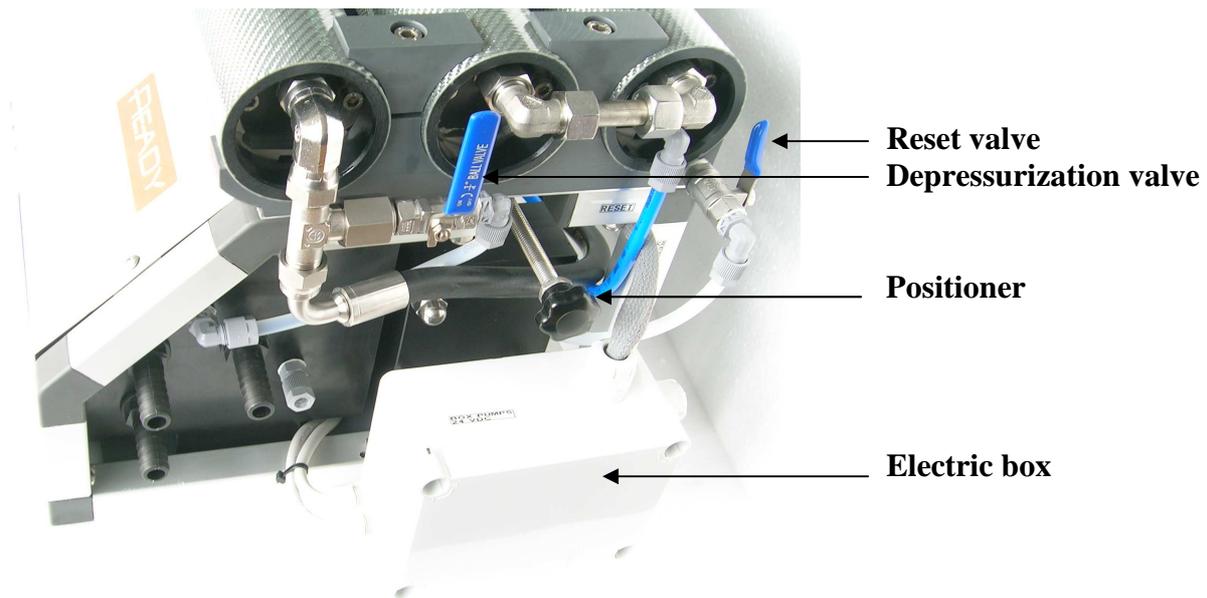
Accumulator unit. Is a cylindrical unit located on the left of the unit. Its purpose is to dampen the pump's pressure oscillations during the watermaking. The accumulator is factory pre charged with air to a pressure of about 3 BAR This can be recharged using the valve on the unit and a tyre pump. It may be worthwhile checking this pressure when first starting up of the watermaker after installation.

Filter. The transparent filter housing contains a 5 micron filter cartridge, and its job is to filter impurities that may damage the ERS. The cartridge must be replaced regularly.

Reverse osmosis membranes, inside the 3 silver high-pressure vessel are used to separate the intake high-pressure seawater into two flows: one for the salt-water waste and one for fresh water production.

Energy Recovery System. Amplifies the pressure supplied by the electric pumps pump and recovers the hydraulic energy back from the membranes. The ERS device makes periodic cycling by a hydraulically controlled automatic valve. The cycles are noticeable through a "beat" issued periodically by the watermaker. The unit contains two cylinders, and a central body housing the hydraulic valves.

Manometer is located on the front panel, and it measures the running pressure of the pumps.



Depressurization valve. Is used during the air bleeding phase (i.e. at the first system start-up or after a filter cartridge replacement). This is a blue lever located to the right side of the watermaker. Its function is to depressurize the system and allow air bleeding. The valve remains closed during normal working conditions and is opened only during the air bleeding operations. The lever need only be opened halfway (45°) during air bleeding operations.

Positioner: A stainless steel threaded arm, with a black knob, located on the right side of the unit. Its function is to reset the unit in start up failure when the unit has been stopped in the exact centre of a cycle.

Reset valve. It is the small valve located to the rear, right hand corner of the watermaker . It is a small blue plastic lever. The valve must be closed during normal functioning (lever perpendicular to the valve). This valve allows resetting in case of a system failure It must be opened before using the valve positioner.

Computer box. It is a separate component that must be installed outside the watermaker. To the computer box is connected a smaller grey box containing the electric connections (computer connections box).

The computer controls the functions of the watermaker automatically. Sited on the computer box is the *by-pass selector switch*, this by-passes the electronic controls and allows the system to be run manually.

Signal pressure switch. It is installed inside the unit, and is connected to the left side on the main top valve of the ERS. Its function is to check the correct cycling of the ERS. The wires of the device (5 / +) must be connected inside the computer box.

Active carbons filter (with electro-valve) Its function is remove the chlorine from the fresh water of the tanks during the automatic washing of the unit. It must be connected to the fresh water pressurized system of the boat. The electro-valve is piloted directly from the computer throw the cables 10 and -.

2. Installation

2.1 General criteria

A planned installation will make both fitting and operation of your Ready 60 watermaker easier. Details below need to be taken into account with your installation:

- ✓ An appropriate seawater intake with necessary fittings.
- ✓ Positioning of the watermaker .
- ✓ Positioning of accessories.
- ✓ Pipework and cable laying.

A good installation needs to be easy to use, easy to access for maintenance and filter changes. All Watermaker components have been designed to achieve all of this. Draw a schematic electric and hydraulic connection diagram when the installation plan is complete and keep it with this manual for reference.

2. Installation

2.2 Components mounting

Watermaker positioning.

The horizontal and vertical distance of the watermaker, from the sea water inlet, is a critical aspect of the installation. Even if the pumps are self-priming type, it is strictly advised to install the watermaker **as low as possible respect the sea level, and as close as possible respect the sea water intake.**

If the watermaker is positioned too much above respect the sea level or too far from the water inlet, the pumps will have difficult in inhaling water and frequent blocks can occur.

Usually the vertical distance respect the sea level is more critical than the horizontal distance from the water intake. In example if the unit is positioned below the sea line, a distance from the water inlet up to 3 meters can be tolerated.

On contrary, if the watermaker is positioned above the sea level, it is recommended a distance from the water inlet of max 1-2 mts.

Anyway never install the unit above more than 30 cm. respect the sea level.

Avoid locating the unit where a loss of water can cause damage or jeopardize its safety.

Allow sufficient space for access to the casing containing the filter cartridge.

The unit must be installed horizontally on a suitable base strong enough to support its weight.

It may be necessary to create a suitable wooden or fiberglass structure for the unit if an existing one not available. Avoid installing it on a surface susceptible to vibration.

The unit can be a little noisy in operation. Possible areas for siting are: sink closets, under berth lockers, wardrobe bases (creating a false floor above it.)

Active carbons filter

The active carbons filter (and the preassembled electro-valve) need to be positioned vertically.

There are not specific restriction regarding the distance from the watermaker. The filter housing is fixed, by means of Parker type screws, through the bracket supplied. It is necessary to leave sufficient space below to allow unscrewing replacement of the filter.

2. Installation

2.3 Water intakes

The necessary hydraulic intakes are:

- **Seawater intake**

It is ideal a specific sea water intake, size 3/4" min. in a central position, well under the water surface even when the vessel is well heeled over.



The skin fitting is recommended. It must be oriented to the bow of the boat.

As alternative it is possible Tee into an water inlet as long as the following conditions are met:

- 3/4" minimum size,

- No air can be introduced into the system from other use ie: salt water tap in galley

- Must always be under the water surface even when the vessel is well heeled over.

Allow a minimum 1/2" on-off ball valve on the water intake. The hose connections, especially if under the seawater level, must be secured with double hose clamps.

It is not advisable to Tee into the engine cooling water intake as it may impair the cooling of the engine. An easily inspected mesh type filter will be required close to the water intake. The filter has to be of 50 microns. It is possible to use filters from existing outlets

- **Fresh water intake for washing.**

Tee in downstream of the vessel's fresh water pressure system (Domestic water from tank) .

IMPORTANT

Flushing must always be carried out executed with the pressure water system ON.

The pressure water system must NOT exceed 2.5 BAR.

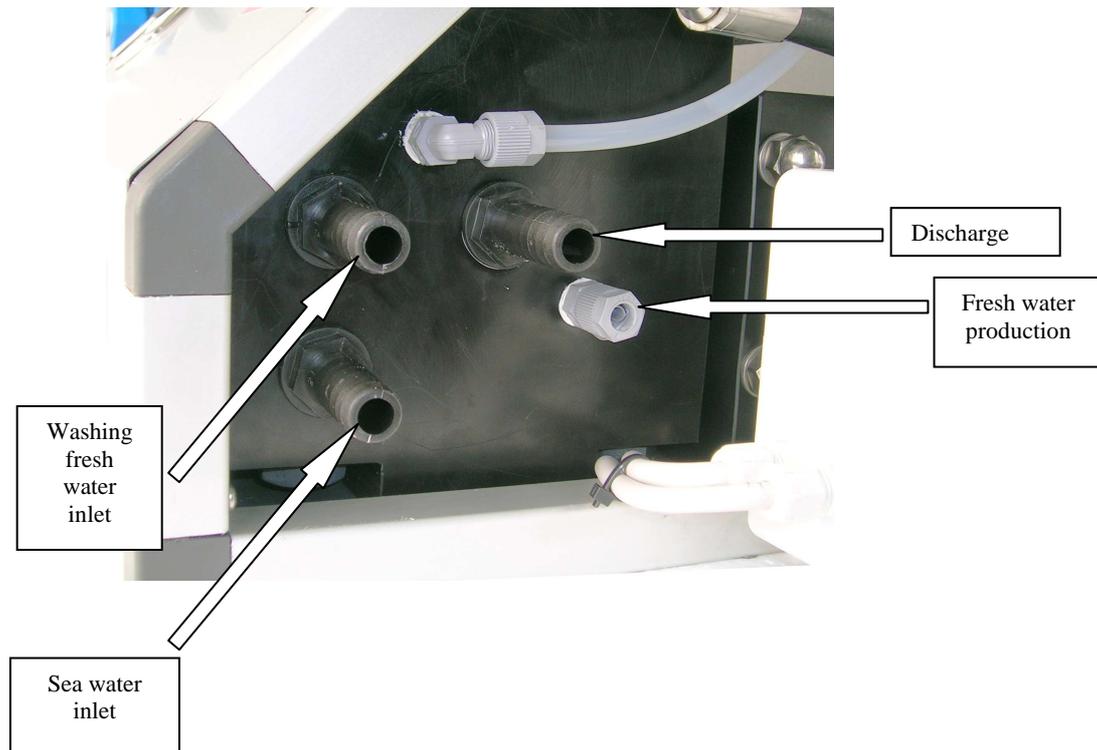
- **Salt-water waste (discharge)**

The salt-water reject fitting must be 1/2" minimum and preferably above the seawater level.

Again, if required you can tee into an existing skinfitting ie: sink water out, one way valves may need to be considered. The watermaker waste pipe must be unobstructed when the machine is in use.

2. Installation

2.4 Hydraulic connections.



All of the hydraulic connections are positioned on the right side of the machine.
The specification of the connectors is the following:

Sea water inlet:

16 mm. internal diameter hose holder

Fresh water inlet for washing :

16 mm. internal diameter hose holder

Exhaust discharge:

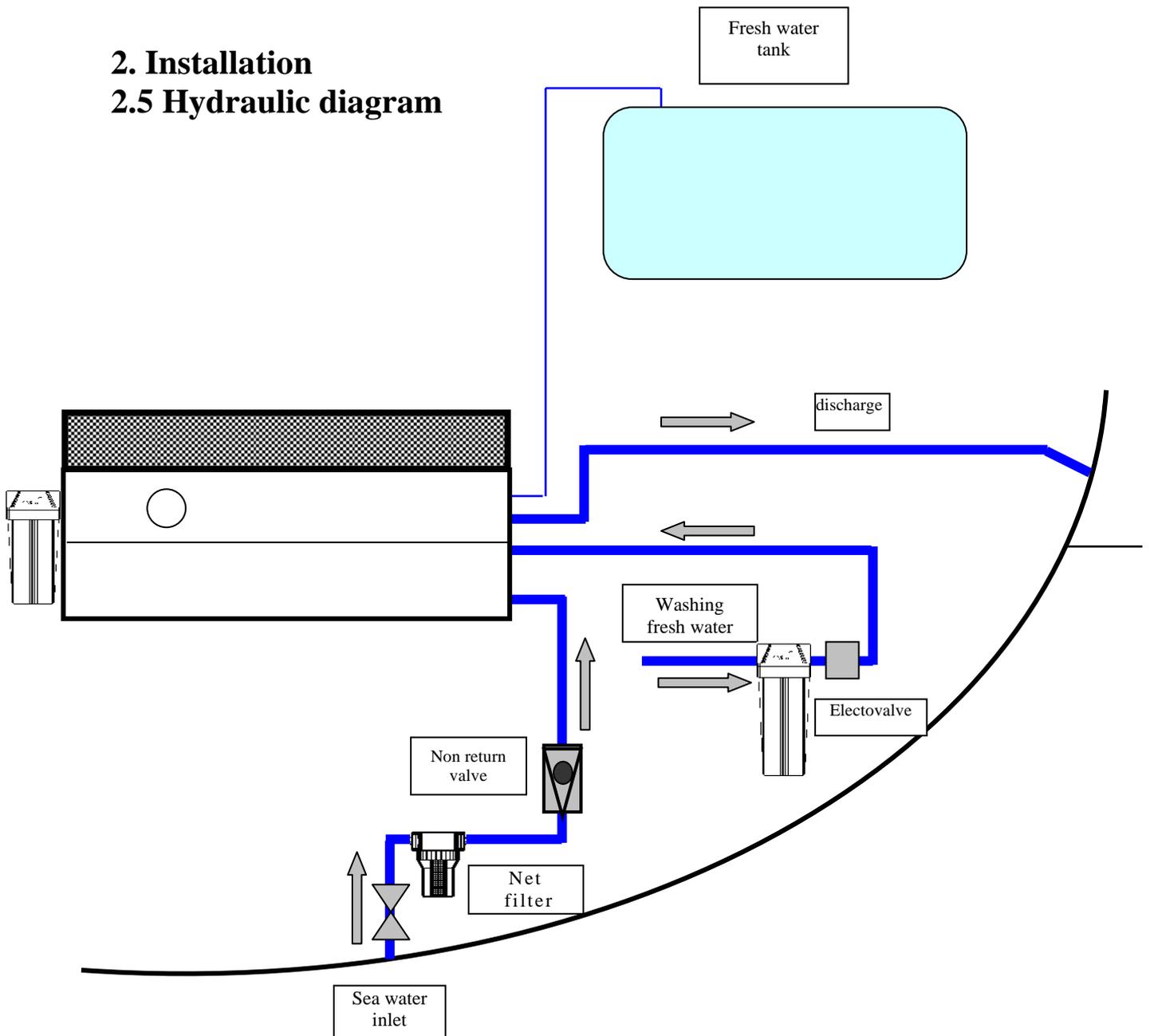
16 mm. internal diameter hose holder

Fresh water production:

Compression fitting for 6 mm. internal /8 mm. external hose

2. Installation

2.5 Hydraulic diagram



For all the hydraulic connections (except the fresh water production pipe) use a spring type 16 mm. internal diameter hose (not furnished) and a 1/2" fittings. The hose **must be min. PN 5** (it must work safely with a pressure up to 5 bars).

IMPORTANT:

Sea water inlet connection.

Install the non return valve as low as possible and close to the net filter.

The hose laying must be as short and linear as possible.

Discharge connection.

Create a Swan neck upward (20 cm. above the watermaker) when the drain outlet on the vessel is positioned below the watermaker unit, in order to guarantee a water head.

Connection to the fresh water tank (use the furnished blue 6X8 hose).

The connection has to be made using the small hose supplied with the equipment. The connection has to be made to the upper side of the tank, on a 1/4" outlet if available.

It is possible, in case of metal tanks, to make a 1/4" threaded hole to connect the supplied male connector. Another option is to Tee into the tank air vent hose. This is only possible if the breather pipe section is more than 16 mm. dia. There are no particular limits on the connection length.

2.Installation

2.6 Electric connections

The electric connections must be done between the electric box of the watermaker and the small box connected to the computer. The power supply, coming from the service batteries, needs to be connected to the terminals – and + of the computer box (see the table below for the recommended section). The connection to the vessel's control panel needs to be downstream the voltmeter and the ammeter. The connecting terminal must be suitable to support electric load (approx. 250 Watt). A 32 A automatic circuit breaker (for 12VDC systems) must be installed on the power supply , and 16 A (for 24VDC systems).

Electric cable: red/black single-pole cable, flame-retardant type sea wiring. The cable must be of sufficient thickness to avoid voltage drop.

Voltage	Automatic switch	Cable lenght					
		up to 3 mts		3 - 7 mt.		7-10 mt.	
Volt	Ampere	mm2	AVG	mm2	AVG	mm2	AVG
12	32	10	7	16	5	25	3
24	16	4	11	4	11	6	9

Main power supply cables and switches selection table.

✓ Remote control panel mounting

The remote control panel has the following dimensions:

width 12 cm height 8 cm.

It can be flush mounted on any surface, providing the area behind is free of moisture and condensation and there is enough depth to house the rear part of the panel (approx. 8 cm.).

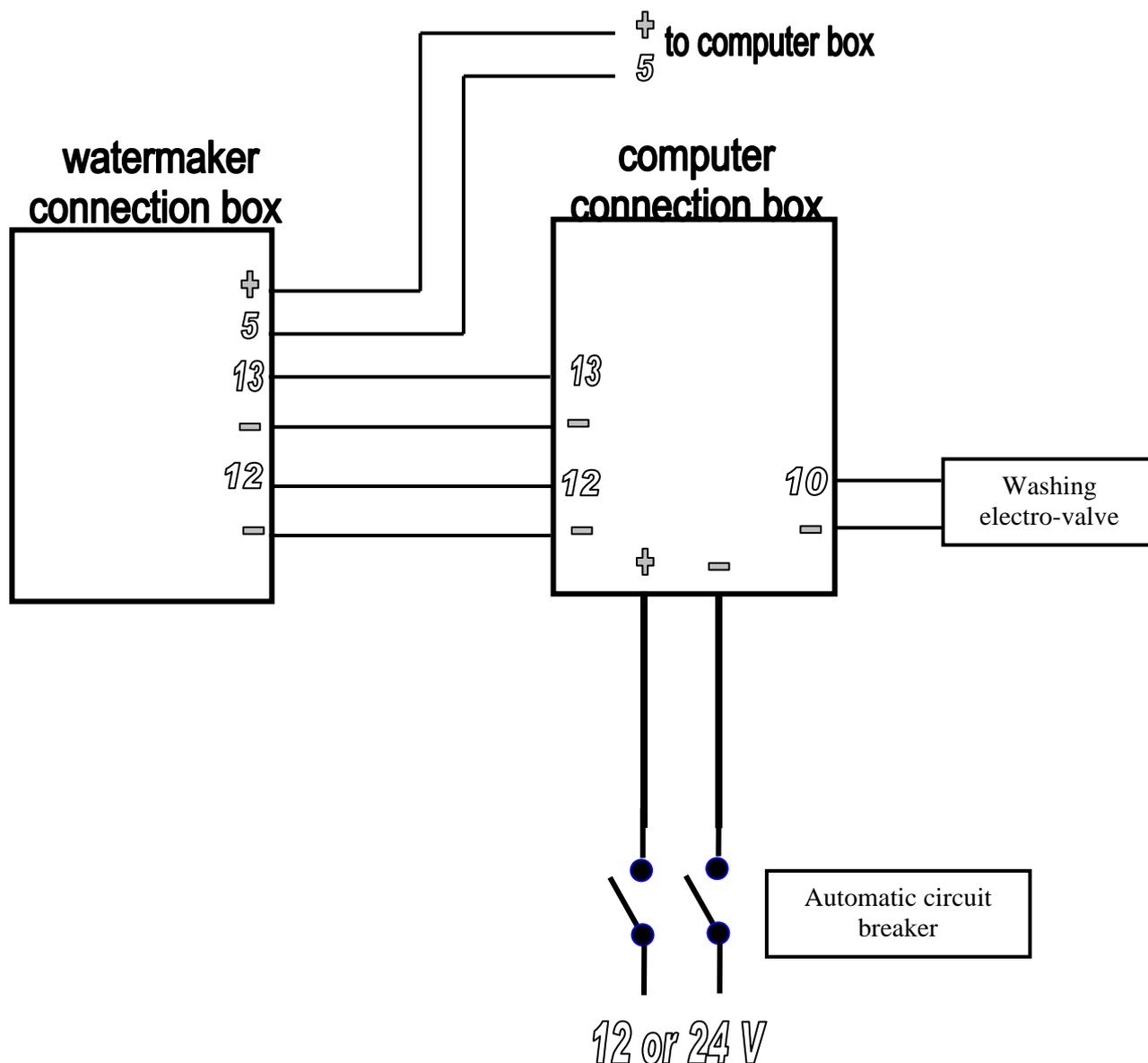
Avoid laying the computer cable in areas where it will be submerged in water.

To flush mount the control panel a hole with the following dimensions will be required:

width 9 cm height 5 cm.

The remote panel is connected with the computer throw the pre wired black cable supplied.

Electric connections



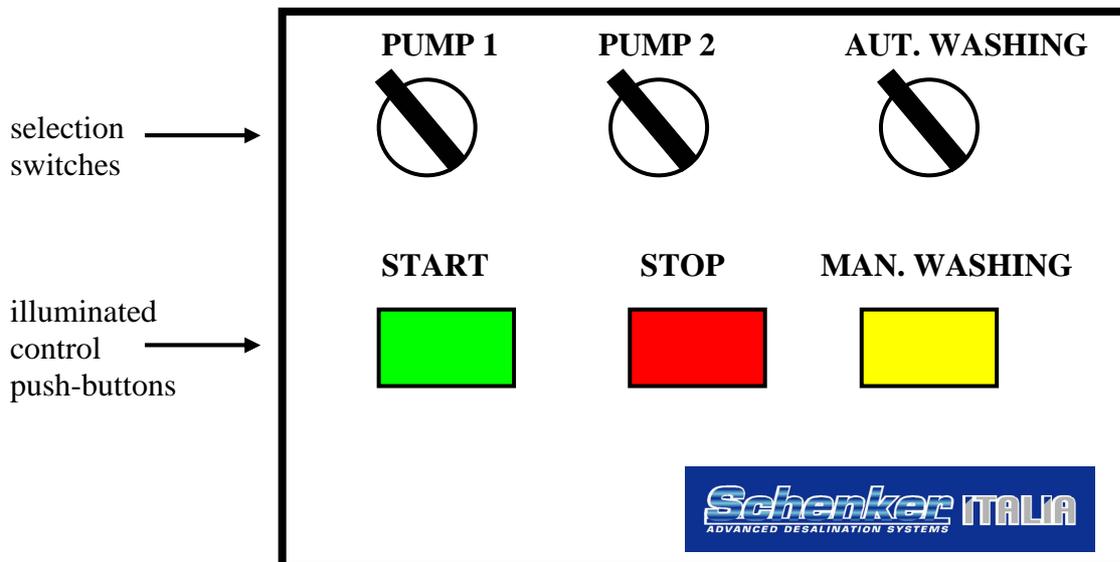
Clamp

connection

section

+	watermaker box - computer	2,5 mm ²
5	watermaker box - computer	2,5 mm ²
13	watermaker box – computer box	min 10 mm ²
-	watermaker box – computer box	min 10 mm ²
12	watermaker box – computer box	min 10 mm ²
-	watermaker box – computer box	min 10 mm ²
-	battery- computer box	see table
+	battery- computer box	see table
-	computer box – electro valve	2,5 mm ²
10	computer box – electro valve	2,5 mm ²

3. Operation



3.1 By-pass activation

The by-pass is activated by turning the switch located on the computer box clockwise. When the by-pass is activated, all the electronic functions (diagnostic, automatic washing, etc.) are disabled, and the unit works in manual mode (the pumps 1 and 2 are activated acting directly on the PUMP1 and PUMP2 selectors). It is not possible to perform fresh water washing with by-pass activated. By-pass activation is signaled by the continuous green light of the start push-button.

The operation with the by-pass is necessary only in the following two circumstances:

- ✓ Plant first start-up or plant restart after maintenance operations. The use of the bypass is required at start up when purging air from the system. Without this in operation the computer would sense that there was deviation from normal operation tolerances and would continually shut the unit down.
- ✓ Electronic failure

In the case of electronic control system failure, the by-pass allows use of the plant manually by selecting pump 1 and pump 2 switches manually. It will however not allow fresh water flushing of the unit as the Electro valve is controlled by the computer.

IMPORTANT

Do not engage the by-pass without good reason, as all diagnostic and automatic functions are disabled when the by-pass is activated.

3. Operation

3.2. First start-up procedure

The first start-up procedure should be followed when starting a new plant for the first time or when restarting after laying up.

Preliminary checks:

- ✓ Check that the reset valve is closed (lever orthogonal to the body valve) and the positioner unscrewed.
- ✓ Check that 5 micron filter cartridge is installed in the cartridge holder, and screwed on tightly.
- ✓ Check that the seacock and the waste water drain valves are open.
- ✓ Check that the valve on the active carbon filter is opened.
- ✓ Check that the vessel's pressure water pump is on.
- ✓ Check that the vessel's fresh water tanks have enough water in them to perform the first washing operation.

Start-up procedure:

1. Open the depressurization valve at approx. 45° (halfway).
2. Push for 20- 30 sec the red push-button located on the CA filter in order to purge the air from the filter.
3. Leave both selectors PUMP1 PUMP2 and AUT WASHING not selected (vertical lever).
4. Push the push button MAN WASH. Now the electrovalve opens, filling with fresh water the water inlet hose. After 20 seconds the red light STOP will flash. Recognize this alarm pushing the push button STOP. Repeat this step again.
5. Connect the by-pass, by turning the switch clockwise (the START push-button green pilot light comes on).
6. Start the first pump acting on the PUMP1 selector. After approx. 2 minutes start PUMP 2 and turn off PUMP 1. Leave PUMP 2 on for approx. 2 minutes and then start again also PUMP 1, for further 2-3 minutes. Turn both pumps off.
7. Disconnect the by-pass by turning the selector anticlockwise (the START push-button green pilot light turns off). Close the depressurization valve (vertical position of the blue lever).
8. Activate AUT WASHING and both pumps, and then push START. The system starts going under pressure and the fresh water production begins.
9. Verify that there are no water leaks in the hose connections. In such case, fasten the hose clamps further. Stop the system pushing STOP. The machine will not stop immediately, but will perform before an automatic washing.

Warning: the electronic computer is equipped with a minimum voltage block calibrated at about 10,8 volt (12 VDC systems) and at 21,8 volt (24 VDC systems).

This protection is necessary to avoid potential battery damage and interference with the functioning of other equipment ie: Navigation aids.

When starting the watermaker there is a short surge of power greater than the normal consumption of the unit. If the vessel's batteries are low the computer may shut down the unit disabling the unit under electronic control.

This can be confirmed by looking at the LED on computer, inside the Computer Box. In normal conditions this LED is green. If the shutdown is due to insufficient voltage, the LED turns red for a few seconds. In this case check the battery voltage.

In this case (low voltage) the watermaker can also be switched on, in manual mode, by turning on the by-pass, or in electronic mode by starting one pump at a time (turn selector PUMP 1, press START, after few minutes turn selector PUMP 2).

3. Operation

3.3. Normal operation procedure

1. Check that the seacock and waste water drain valve are opened.
2. Check that the depressurization and reset valves are closed and that the by-pass is not connected.
3. Check that the Pressure Water system is turned on.

✓ **Fresh water production cycle without automatic washing**

The automatic washing procedure uses 7 to 8 litres of water. If the unit is in use daily it is not necessary to carry out this procedure every time water is produced. As long as the watermaker membrane is cleaned once a week whilst in daily use, no long term damage will be done to the watermaker.

1. Preset the pumps by turning the PUMP1 and PUMP2 switches clockwise (An approx. 30 lit/hour water production is achieved by activating one pump with a 100 Watts consumption, while an approx. 60 lit/hour water production is achieved by activating 2 pumps with a 240 Watts consumption).

2. Do not turn on the automatic washing switch. Check that the AUT WASHING switch is in vertical position.

3. Push the START button (the START push-button pilot light come on and water production will begin).

4. Push the STOP button at the end of the production cycle. Do not turn the pumps off with the pump switches as the shutdown operation will not be done electronically. There is a chance that if turned off with the mechanism in a central position, the machine will become blocked and need resetting manually. After pressing the Stop button the unit will not turn off immediately, but after few seconds. This is quite normal as the computer repositions the mechanism in the correct position before deactivating the pumps).



If during production the computer detects an anomaly (cycling missing, low pressure, etc.) the watermaker will automatically shutdown 20 sec. after having noted the anomaly and the STOP push-button pilot light will blink. It is necessary to push the STOP button to restart the unit to confirm to the computer that the failure has been recognized). Before restarting the watermaker, it is necessary to check the reason for the failure and remove its causes.

✓ **Fresh water production with automatic washing**

(For use when the watermaker is not used on a daily basis or when automatic washing is required after every water making session.)

1. Preset the pumps by turning the PUMP1 and PUMP2 switches clockwise.
2. Preset the automatic washing by turning the AUT. WASHING switch clockwise.
3. Push the START button to start the plant (the START push-button pilot light come on and the production will begin).
4. Push the STOP button at the end of the production cycle. The plant will not turn off immediately, but a washing cycle will be automatically activated lasting approx 50sec. During the cycle the MAN WASHING push-button pilot yellow light will also light up. The watermaker will automatically shutdown after the washing cycle has finished.

The fresh water consumption during an automatic washing operation is approx. 7 to 8 litres

✓ **Manual washing cycle**

(If the unit is to be left unused for 2-3 months)

This operation is not intended for fresh water production, but serves to perform a deeper rinsing of the watermaker, prior to long periods of inactivity.

Before starting the manual washing, ensure that there is a sufficient quantity of fresh water inside the vessel's water tank. Fresh water consumption during this washing cycle is approx. 10 litre/min.

1. Turn on the pressure water system.
2. Preset the pumps by turning the PUMP1 and PUMP2 switches clockwise.
3. Do not preset the automatic washing. Check that the AUT. WASHING switch is in the vertical position.
4. Push the MAN WASHING button to start the washing cycle (the START and MAN WASHING button pilot lights will turn on).
5. Push the STOP button to stop the washing cycle.

Do not let this procedure continue for more than 10 minutes as this is more than sufficient to remove any build up of salt in the watermaker, It will also very quickly empty your water tank.

ATTENTION

If the watermaker has been stopped by using the pump switches and not the Stop button, or if some air is in the system, the automatic hydraulic valve may stop in a central position. This means that pressure on both sides of the valve are the same and the unit is effectively stalled and has to be manually restarted.

The symptoms of this are when the pumps are turned on, the manometer reaches an elevated pressure (more than 9 Bar) and the pumps shutdown automatically by the pressure switches intervention. The pumps then have the tendency to try to restart when the pressure decreases, and then to jam again, resulting in a typical start-stop noise. After approx. 20 sec. the computer senses the anomaly, and turns the pumps (the red light flashes).

Recognize the alarm activating the STOP push-button.

This phenomenon, besides being very rare, does no harm to the system, but it is necessary to reset the valve with the following simple procedure:

RESET PROCEDURE

- 1. Turn the system off.**
- 2. Open the reset valve (lever in horizontal position).**
- 3. Screw the positioner knob clockwise until it can be moved no further. 10 turns at least are necessary.**
- 4. Unscrew the positioner knob up to the original position, until when it is blocked back.**
- 5. Close the reset valve (lever in vertical position).**
- 6. Restart the system**

4. Maintenance

4.1 Shutdown procedure

It is necessary to perform the shutdown procedure before effecting standstills longer than 3 months, for instance before laying up for winter.

The purpose of the shutdown is to clean the unit of possible deposits of limestone, and to inhibit the growth of microorganisms that may reduce the reverse osmosis membrane's efficiency.

The following equipment is necessary in order to perform the shutdown operation:

- ✓ 1 ea. recipient 20 liters minimum capacity (a bucket of such capacity could also be suitable).
- ✓ Two 16 mm. linen hoses of a length that allow them to be fed into the same container
- ✓ A prepared shutdown solution **SCHENKER CLEANING 1**.
- ✓ Tools for de-assembling hoses (screwdrivers, pliers, etc.)

The shutdown procedure is:

1. Replace both active carbon filter and 5 microns cartridges.
2. Collect approx. 15 liters of unchlorinated fresh water into the bucket. The water produced by the watermaker itself could be fine.
3. Empty the entire content of the SCHENKER CLEANING 1 solution into the picked water, and mix carefully following the indications on the pack. Wear a protection mask in order to avoid inhaling product dusts. The water temperature doesn't have to be lower than 25°C preferably. Disconnect the watermaker's sea water inlet hose and discharge hose.
4. Insert the end side of the 2 hoses into the bucket, verifying that the hoses have been properly dipped in the solution and that they don't inhale air.
5. **Open the depressurization valve at 45°.**
6. Start the watermaker (with both pumps, and bypass activated) and leave the system on for approx. 30-40 min., checking that the hoses are properly positioned in the container, so as to avoid drawing air or spilling the liquid into the boat.
7. Turn the watermaker off, and re-connect the hoses, without drain out the solution.

When the unit is restarted open the depressurization valve at 45° for about 10 minutes in order to completely drain out the chemical solution.

Chemical Cleaning Kits:

Schenker No 1 is an acid based organic cleaner.

This is used for 'pickling' the watermaker when not in use and as part of the general cleaning process. See 4.1 Shutdown procedure

Schenker No 2 is an alkaline base organic cleaner. If the watermaker has been left standing without pickling or has a 'bag egg' smell, cleaning with Schenker No2 will remove this.

4. Maintenance

4.2 Verifications and periodic maintenance

The following periodic procedures are to be followed to maintain trouble free operation:

- **Purge the air periodically.**

During the function sometime air can be collected in the unit. Periodically (i.e. every 10 days) purge the air opening, during the normal functioning, the depressurization valve for 20-30 seconds.

- **Check the filter**

It is necessary to replace the filter if it is particularly dirty. The changing interval depends on the number of daily working hours of the watermaker, and on the cleanliness of the seawater where it is used.

It is necessary to replace the filter every 15-20 days under normal conditions (4 hours/day usage).

It is necessary to purge air from the housing once the filter has been cleaned or replaced. Leave the watermaker on for 2-3 minutes with the depressurization valve opened at 45° to perform the purging.

- **Check the plant working pressure**

Check the pressure on the manometer located on the front panel.

The working pressure depends on many factors such as water temperature, salinity level of seawater, battery voltage, cleanliness of membranes and type of installation.

The pressure, under mid range working conditions is approx. 5,6 BAR with one pump on, and approx. 7,6 BAR with two pumps on. There is a small pressure loss, in the range of 0,2 Bars, during the cycle.

If the average pressure exceeds the above range it is necessary to check:

1. Check for obstructions in the suction or drainage hoses (ie: kinks in the hose).
2. The battery voltage.
3. The cleanliness of the membranes. If the membranes are dirty it will be necessary to perform the shutdown procedure 4.1. If there is little improvement it may be necessary to perform an alkaline wash using the chemical product SCHENKER CLEANING 2.
4. The seawater temperature. If the temperature is lower than 18°C (winter temperature) the pumps pressure can, exceed 8 Bar. In this instance could be necessary increase slightly the working pressure of the pressure switch to bring the pressure back to 7,8-8 Bar.(1.3 System description)

- ✓ **Check for absence of leaks**

It is necessary check this at plant start-up, since possible leaks due to accidental causes (pipe bursting, hose clamp loosening, equipment failure, etc.) may cause leaks, and endanger the vessel.

- ✓ **Membrane replacement**

The reverse osmosis membranes have an average working life of 5-6 years. After 5 years they usually may start to degrade. If in doubt as to their condition contact a Schenker service point and replace as a matter of course after 7 years.

4. MAINTENANCE

4.3 SYSTEM TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	SOLUTION
Pumps do not start	Pumps pressure switch burned	Replace
	Electronic failure	Activate the by-pass
Pumps start but stop at high pressure	System is blocked Dirty filter Dirty membranes Trouble in the cycling system	Perform Reset procedure and purge the unit Replace cartridge Perform cleaning cycle Contact a Schenker service point
While functioning the pumps momentarily shuts down	Dirty filter or membranes Pump pressure switch not calibrated Cold sea water	Clean or replace See 4.2 Calibrate pressure switch Calibrate pressure switch
Low production / normal or low pressure	Low battery voltage Air in the plant Seal system leak	Check battery voltage Perform bleeding See 3.2 Contact a Schenker service point
Low production / high pressure (> 8 Bar)	Cold sea water Dirty membranes	Normal condition Calibrate Pressure switch Perform cleaning cycle 4.2
Leaking in the plant	Loose pipe connections ERS loss	Tighten connections Contact a service point

ELECTRONIC TROUBLESHOOTING

□ **When pressing start button the system will not start**

Check that the by-pass is not switched on (bypass switch turned anticlockwise) and that at least one pump is activated (switch PUMP1 or PUMP2 turned on).

If the system still fails to start...

Check that electric cables are properly connected, follow the wiring scheme indicated in the manual and that the main automatic circuit breaker is in place.

If the system still fails to start...

Check with a tester, the 12/24 VDC electrics box power supply, between clamps + and - .

If the system still fails to start...

Turn off both pump 1 and pump 2 selectors (vertical position). Push **START**.

If the green pilot light turn on and, after 20 seconds the system shutdown (because the pumps are not connected) the problem is due to low battery voltage.

If the system still doesn't start check all electric wiring, electrical connections box, pre-wired cable remote panel for fault. Replace as required.

□ **When pressing **START** the system starts, but shuts down after 20 seconds.**

Check for a hydraulic block. (the pressure on the manometer will be greater than 8 bar and pumps are shut down) . In this case perform the reset procedure and restart the system. (Page 16)

If a hydraulic block has not occurred, the most probable cause of the fault is a malfunction of the pressure switch.

The pressure switch can be tested with following procedure:

1. Disconnect the pressure switch cables (clamps 5 +).
2. Activate the by-pass and start the system in manual mode.
3. Check with a tester in ohm position the functioning of the pressure switch. In normal conditions the pressure switch closes and opens the circuit each 3-4 seconds.
4. If the pressure switch remains either closed or open during the functioning of the watermaker, the switch is faulty and must be replaced.



SAFETY WARNINGS

- ✓ Ensure the watermaker is correctly installed by contacting a Schenker service point.
- ✓ Unless the correct cleaning procedures are carried out in accordance with this manual, there may be bacteria present in the produced water. Therefore don't drink the water if a UV sterilizer is not installed.
- ✓ Avoid using the watermaker where seawater is polluted (ports, or close to built-up areas, etc.)
- ✓ Do not locate near the pumps unit in areas that can reach elevated temperature. I.e: Engine compartments or where inflammable substances are stored. This will adversely affect the working of the pumps and may present a fire risk.
- ✓ Do not touch the pumps and pump fans when the unit is working.
- ✓ Children and those unfamiliar with the watermaker shall not touch or operate the unit.
- ✓ Check periodically for leaks.
- ✓ Do not operate the watermaker when the vessel is left unattended.
- ✓ Avoid installing the watermaker where a leak may go unnoticed and jeopardize the safety of the boat.
- ✓ Unqualified and non-Schenker personnel shall not perform any maintenance work on the watermaker

6. Most frequent operations summary table

✓ **Fresh water production without automatic washing:**

1. Seacock and waste water drain valves open.
2. Depressurization and reset valves closed.
3. AUT WASHING switch in “off” position.
4. Select one pump (for 30 lit/h water production) or two pumps (for 60 lit/h water production).
5. Push START button to start the production.
6. Push STOP button to turn the watermaker off.

✓ **Fresh water production with automatic washing at the end of cycle:**

1. Seacock and waste water drain valves open.
2. Pressure water system turned on.
3. Depressurization and reset valves closed.
4. AUT WASHING switch in “on” position.
5. Select one pump (for 30 lit/h water production) or two pumps (for 60 lit/h water production).
6. Push START button to start the production.
7. Push STOP button to turn the watermaker off.

✓ **Reset procedure:**

(If the watermaker blocks during the re-start)

1. Turn the system off.
2. Open the reset valve (lever in horizontal position).
3. Screw the positioner knob clockwise until it can be moved no further. 10 turns at least are necessary.
4. Unscrew the positioner knob up to the original position, until when it is blocked back.
5. Close the reset valve (lever in vertical position).
6. Restart the system

✓ **Clean or replace the filter every 15/20 days.**

✓ **Purge the air periodically, opening for 20-30 seconds the depressurization valve during production cycle.**

7. WARRANTY

The equipment and the relevant accessories are guaranteed 12 months from delivery. The guarantee does not include consumable items (filters, carbon filters, membranes, etc.). The “ERS” pressure amplification device is guaranteed 36 months, provided that the annual maintenance is performed at a Schenker service point.

The guarantee covers faults, defect of materials and parts. It is limited to the replacement or repair of faulty parts. The expense for the disconnecting and reinstalling on the vessel and transport of the equipment from or to our Service Point, or our factory will be at the customers own expense.

The under guarantee delivered parts transport, will be at customer’s own risk.

In case of repairs under guarantee performed by our technicians on the customer vessel, the faulty parts replacement cost will be at Schenker's expense, while manpower and travel expenses will be charged to the customer. The guarantee does not include faults caused by negligence in operating, maintenance and installation of the device (if not carried out by an authorised Schenker Service point).

Dismantling by non-authorized personnel will render void all guarantees. Schenker Italia can not be held liable for any direct or indirect damage caused by the malfunctioning equipment, limiting its responsibility to the repair and replacement of faulty parts.