Installation, operation and maintenance instructions

Watermaker system

QUBE 65 TOUCH

12/24 V DC

Schenker®
WATERMAKERS

CE

TABLE OF CONTENTS

1. CONSULTING THE MANUAL 1
1.1 MANUAL STRUCTURE 1
1.2 DESCRIPTION OF SYMBOLS 1
2. GENERAL WARNINGS AND INFORMATION FOR THE CUSTOMER 2
2.1 IMPORTANT INFORMATION 2
2.2 DECLARATIONS OF CONFORMITY 2
2.3 SAFETY WARNINGS 2
2.4 LIMITED WARRANTY 3
2.4.1 SUBJECT, DURATION AND CONDITIONS OF THE LIMITED WARRANTY 3
2.4.2 LIMITED WARRANTY EXCLUSIONS AND/OR LIMITATIONS 3
2.5 DESCRIPTION OF THE SYSTEM 4
2.6 SYSTEM IDENTIFICATION 5
2.7 NORMATIVE REFERENCES 6
2.7.1 STANDARD DIRECTIVES FOR SYSTEM SAFETY 6
2.7.2 ENVIRONMENTALLY FRIENDLY - DISPOSAL 6
3. GENERAL 7
3.1 TRANSPORT 7
3.2 STORAGE 8
3.3 COMPONENTS INCLUDED IN THE BOX 8
3.4 TECHNICAL SPECIFICATIONS OF THE SYSTEM 8
3.5 HYDRAULIC CONNECTIONS 9
3.6 WEIGHTS AND DIMENSIONS 9
3.6.1 PUMP UNIT 9
3.6.2 WATERMAKER 10
3.7 COMPOSITION OF THE SYSTEM 11
3.7.1 SUCTION UNIT 1 11
3.7.2 SEA WATER FILTRATION UNIT 2 12
3.7.3 RINSE FRESH WATER FILTRATION UNIT 3 13
3.7.4 PUMP UNIT 4 14
3.7.5 WATERMAKER 5 15
3.7.6 COMPUTER BOX 6 17
3.8 OPTIONAL 18
3.8.1 DIVERTER VALVE 18
3.8.2 DIGITAL FLOWMETER 20
3.8.3 DIVERTER VALVE + DIGITAL FLOWMETER 22
4. ASSEMBLY AND INSTALLATION 23
4.1 GENERAL CRITERIA 23
4.2 COMPONENT ASSEMBLY 23
4.2.1 PUMP UNIT 23
4.2.2 WATERMAKER 23
4.2.3 FILTRATION UNITS 26
4.3 INSTALLATION 27
4.3.1 WATER INLETS AND DRAINS 27
4.3.2 SEA WATER INLET 27
4.3.3 FRESH WATER INTAKE FOR FLUSHING 28
4.3.4 WATER DISCHARGE 28

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

4.4 HYDRAULIC CONNECTIONS 29
4.4.1 PUMP UNIT CONNECTIONS 31
4.4.2 WATERMAKER CONNECTIONS 31
4.5 ELECTRICAL CONNECTIONS 32
4.5.1 MOUNTING THE CONTROL PANEL 32
4.5.2 ELECTRICAL CONNECTIONS: WIRING 32
5. OPERATION AND USE 38
5.1 DESCRIPTION OF CONTROLS 38
5.1.1 PAGE 1 (MAIN SCREEN) 38
5.1.2 PAGE 2 39
5.1.3 PAGE 3 40
5.2 DESCRIPTION OF WARNINGS AND ALARMS 41
5.2.1 WARNINGS 41
5.2.2 ALARMS 44
5.3 INITIAL START-UP PROCEDURE 45
5.3.1 CHECKS PRIOR TO INITIAL START-UP PROCEDURE 45
5.3.2 FIRST START-UP 45
5.4 NORMAL OPERATING PROCEDURE 46
5.4.1 NORMAL OPERATING PROCEDURE WITHOUT FINAL FLUSHING 46
5.4.2 NORMAL OPERATING PROCEDURE WITH FINAL FLUSHING (RECOMMENDED) 46
5.4.3 TIMER-OPERATED WORK CYCLE 47
5.4.4 MANUAL WASH PROCEDURE 47
5.5 RESET PROCEDURE 48
6. MAINTENANCE (ROUTINE AND EXTRAORDINARY) 50
6.1 FILTER CLEANING CHECK 50
6.2 ACCUMULATOR CHECK 51
6.3 SYSTEM OPERATING PRESSURE CHECK 51
6.4 CHECKING FOR LEAKS 52
6.5 CHECKING AND REPLACING MEMBRANES 52
6.6 STORAGE PROCEDURE 52
6.6.1 NECESSARY EQUIPMENT 52
6.6.2 STORAGE OPERATION 54
6.7 ANTIFREEZE PROCEDURE (STORAGE IN COLD CLIMATES – BELOW 5°C) 57
7. TROUBLESHOOTING 58
7.1 FAULT TABLE 58
8. SUGGESTED SPARE PARTS 61
8.1 SHORT CRUISE (2/3 MONTHS' SAILING) 61
8.2 LONG CRUISE (8/12 MONTHS OF SAILING) 61

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

1. CONSULTING THE MANUAL

1.1 Manual structure

The manual is divided into chapters, which collect all the instructions necessary to use the system correctly to achieve the expected performance without risk.
In each chapter, there is a subdivision into paragraphs to elaborate on essential points each paragraph is identified by a subtitle and a description.
The header of each page contains the reference chapter to remind the user of the page topic.

Each chapter, for example Chapter 1, is divided as follows:

1	Chapter title
1.1	Paragraph title
1.1.1	Subtitle
1.1.1.1	Additional subtitle

The numbering of figures and tables starts again from the beginning of each paragraph; a number as a prefix will indicate the chapter to which it belongs.

1.2 Description of symbols

The following symbols will be used in the manual to emphasise particularly important indications and warnings:

CAUTION:
This symbol indicates general danger and that it is imperative to read the instructions carefully, understand them and apply them because there is a potential risk of damage to the system and/or to people, animals or property if the instructions are not all followed correctly.

PRUDENCE:
This symbol indicates a general obligation and that care and caution should be exercised.

NOTE:
This symbol indicates useful information.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

2. GENERAL WARNINGS AND INFORMATION FOR THE CUSTOMER

CAUTION:
BEFORE STARTING THE SYSTEM, READ THIS MANUAL CAREFULLY AND UNDERSTAND IT WELL AND ALWAYS KEEP IT AT HAND FOR EASY CONSULTATION. IF YOU HAVE ANY DOUBTS, CONTACT THE MANUFACTURER IMMEDIATELY.

CAUTION:
ANY OPERATION NOT EXPLICITLY DESCRIBED OR NOT EXPRESSLY PERMITTED BY THIS MANUAL MUST BE CONSIDERED STRICTLY PROHIBITED. ANY MODIFICATION TO THE SYSTEM OR ITS INTENDED USE IS ALSO PROHIBITED.

CAUTION:
Since each manual must be read before using the system, whoever uses or lends the system for use implicitly and irrevocably acknowledges that the Manufacturer cannot be held liable in any way (whether civil, criminal or otherwise) in the event of an accident occurring due to violations of one or more (without exception) provisions of this manual.

2.1 important information

To ensure operator safety and avoid possible damage to the system, it is essential to carefully read the entire manual before proceeding with the installation of the system.

This manual must remain complete and legible in its entirety. Every operator involved in the use or maintenance of the system must know its location and must be able to consult it at any time.

2.2 Declarations of Conformity

This system complies with the following Directives:

- Directive 2006/42/EC (MAC)
- Directive 2014/35/EU (LVD)
- Directive 2014/30/EU (EMC)
- Directive 2011/65/EU (RoHS 2) and 2015/863/EU (RoHS 3)

2.3 Safety warnings

- Wear the following protective equipment for the operations to be performed:
  - Working gloves EN ISO 21420:2020
  - Protective goggles EN 166:2001
  - Safety footwear UNI EN ISO 20345:2012
- Do not remove or manipulate safety-related components.
- Make the hydraulic and electrical connections according to the instructions in this manual to ensure the correct functioning of all the system components.
- Avoid using the system if the seawater is cloudy.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

- Check periodically for leaks. Avoid installing the system where a leak could cause damage or jeopardize the safety of the vessel.
- Maintenance work must only be carried out by qualified Schenker personnel.

2.4 Limited Warranty

This Limited Warranty is offered by Schenker Italia Srl ("Schenker") to any person who has purchased a Schenker watermaker system from the Sales Network and is the user of it ("Customers"), as defined below, and is governed by the general conditions set out below. The Limited Warranty will remain valid even in the event of subsequent resale of the System by the Customer. In this case, the subsequent owners are responsible for communicating the identification data and the change of ownership of the System to Schenker, in compliance with the provisions of the General Limited Warranty Conditions.

To be eligible for the Limited Warranty, the System must be installed according to the instructions in this manual and the scheduled maintenance plan must be followed according to the methods and/or frequency described in the same Manual.

NOTE
For the Limited Warranty conditions, always refer to the last revision available on the website "my.schenkerwatermakers.com".

2.4.1 Subject, duration and conditions of the limited warranty

The Limited Warranty guarantees the Customer the free repair or replacement of System components that may present a manufacturing and/or assembly defect, using original Schenker spare parts. It covers the costs of the necessary spare parts and, only in the case of repairs at Schenker or at authorised service centres, the labour costs required to replace the defective components and repair the System. The Limited Warranty does not entitle you to a replacement System for the period of repair.

The transport cost of parts shipped under warranty is borne by Schenker. Any customs charges shall be borne by the Customer.

The Limited Warranty is valid for 24 months from the date of its initial purchase by the Customer, certified by a tax document. The warranty is activated by transmitting the system data and the customer's personal details to Schenker via the website *my.schenkerwatermakers.com.* The warranty activation data must be transmitted within 30 days of receiving the system. In any case, the customer's rights are protected by the legal warranty.

The verification and analysis of the causes of any defects reported by the Customer is carried out by the Schenker Network (whose references are listed in the links *schenker.it/service-italia/* and *schenkerwatermakers.com/dealer*) or directly from Schenker technicians at their headquarters.

Once the Limited Warranty period has expired, all costs of any repairs of the System will be borne by the Customer.

Should the customer fail to communicate the date of purchase of the System, the Limited Warranty activation date will be the date of sale of the System by Schenker to the retailer indicated on the invoice.

Under no circumstances does the Limited Warranty cover indirect or consequential damage caused by the System itself.

2.4.2 Limited warranty exclusions and/or limitations

The Limited Warranty does not cover:

a. The replacement of consumables and, in general, components subject to wear and tear or deterioration, such as, but not limited to: reverse osmosis membranes, gaskets, filters, impellers and pump membranes.

b. Replacement of freshwater post-treatment systems;

c. Damage due to inadequate or missing routine maintenance (filter changes, winterization, etc.);

d. Damage resulting from accidents, falls and fortuitous events;

e. Damage caused by the use of filters or cleaning products not indicated in this manual;

f. Faults and damage resulting from use that does not comply with the instructions contained in this manual;

g. Faults and damage caused by installation that does not comply with the instructions in this manual, in particular incorrect positioning of the pump;

h. Damage caused by freezing in the absence of antifreeze treatment.

i. Failures and damage due to force majeure, such as exposure to atmospheric agents (hail, sun, rain, lightning, etc.);

j. damage caused by:

   i. Repairs and/or maintenance work carried out on the system without following Schenker's specifications and/or carried out by persons unsuitable for the job;

   ii. Prolonged intake of polluted, dirty or marine debris-contaminated water;

   iii. The use of non-original spare parts or components used by Schenker.

k. Scratches on the internal components of the watermaker, defined in *Subtitle 3.7.5*, caused by the use of the watermaker system in water contaminated by suspended organic and non-organic particles, plastics, corals, etc.

l. The damage caused by the use of commercial chemicals containing metabisulfite.

However, the Warranty lapses in the following cases:

a. Improper or disproportionate use of the system;

b. Failure to comply with the maintenance regulations specifically prescribed by the Manufacturer;

c. Even partial alteration of the System and/or its parts.

2.5 Description of the system

The Schenker watermaker system allows pleasure boats to obtain fresh water through the reverse osmosis process that removes salt from seawater. Use a low pressure charging pump. Thanks to the patented ERS (Energy Recovery System), this pressure is amplified hydraulically to push water through the membranes. This system allows for an installation with high energy efficiency and, consequently, low energy consumption.

The Qube line was conceived with the aim of achieving a watermaker with an extremely compact, square design, devoid of external piping and fittings. This makes it possible to install it inside most lockers on boats. The QUBE also uses brushless electric motors, which are extremely silent and reliable. A sophisticated feedback control system allows the engine speed to be automatically adjusted, maintaining the system's operating pressure constant, regardless of external factors. The use of brushless electric motors also allows rpm to be reduced by 30% during washing.

The fresh water produced by our system, under installation, use, and maintenance conditions compliant with the instructions in this manual, is highly pure water with low fixed residue, thanks to the reverse osmosis process. This water is therefore suitable for all sanitary uses. According to Directive (EU) 2020/2184, the suitability of water intended for human consumption, i.e. for drinking and for the preparation of food and beverages, can only be guaranteed by a third-party body that carries out periodic checks on samples, which is practically impossible given the intended use of the system, and therefore cannot be certified.

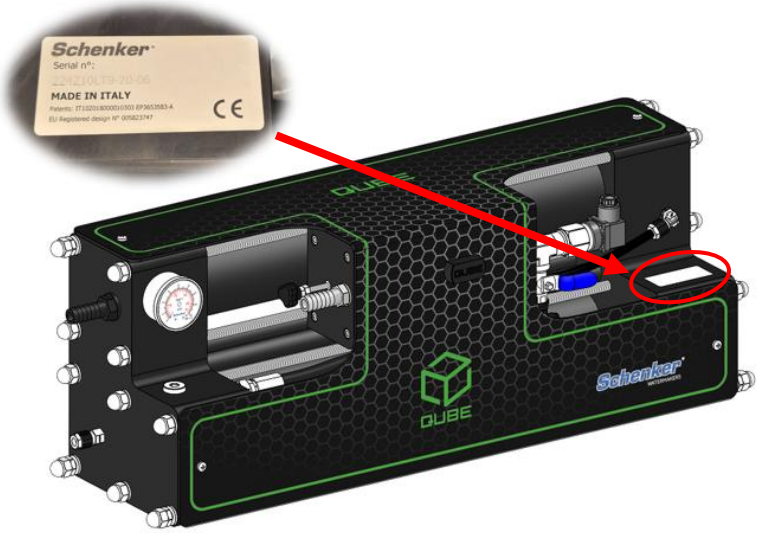
CAUTION

THE FRESH WATER PRODUCED BY THE WATERMAKER IS NOT POTABLE.

2.6 System identification

All Qube systems can be identified by a serial number on two areas of the watermaker body:

1. On a label applied to the right flange of the watermaker;
2. On the back of the main body.



POSITION 1
Fig. 2-1

POSITION 2
Fig. 2-2

2.7 Normative references

2.7.1 Standard directives for system safety

This system complies with:

- All relevant provisions of Directive 2006/42/EC
- The relevant European Union harmonisation legislation below:

Directive	Name	Main requirements and/or main reference standards
2014/35/EU	**LVD**	IEC EN 60204-1:2018 Safety of machinery - Electrical equipment of machines - Part 1
2014/30/EU	**EMC**	**(a)** the electromagnetic disturbances produced do not exceed the level above which radio and telecommunications or other equipment cannot function normally; **(b)** has a level of immunity to electromagnetic disturbances foreseeable on the basis of the use for which it is intended which allows its normal operation without unacceptable deterioration; IEC EN IEC 61000-6-1:2019-06 immunity in non-industrial environments IEC EN IEC 61000-6-3:2023-06 emission in non-industrial environments
2011/65/EU **2015/863/UE**	**RoHS**	reduction of certain hazardous substances in waste electrical and electronic materials **EN IEC 63000**:2021-03

2.7.2 Environmentally Friendly - Disposal

CAUTION

Decommissioning and recycling of the SYSTEM must be carried out in accordance with environmental protection laws and regulations.

With regard to decommissioning and recycling, it should be emphasized that the materials that make up the system do not require special removal procedures. They consist largely of:

- Stainless steel;
- Plastic;
- Carbon fibre;
- Motors, cables and other electrical consumables;
- NBR and polyethylene gaskets.

<u>It is forbidden to abandon and/or release the system and/or its parts in the environment, or to dispose of it in MSW (Municipal Solid Waste) containers as indicated by the WEEE symbol reproduced below. If you decide to no longer use the system, hand it over to qualified scrap dealers or authorised dealers.</u>

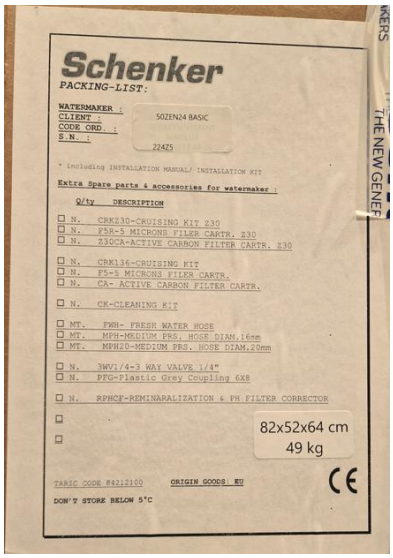
3. GENERAL

CAUTION
Be sure to follow safety instructions.

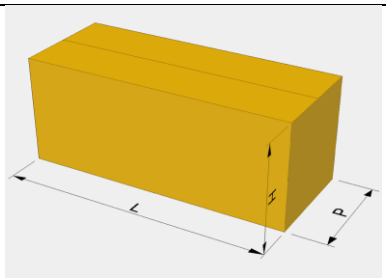
- Wear suitable protective equipment when transporting and handling the system:
  - Working gloves EN ISO 21420:2020
  - Safety footwear UNI EN ISO 20345:2012
- Move the system carefully so as to avoid damaging the components inside.

3.1 Transport

The system is transported in a cardboard box with a packing list attached.



TRANSPORT OF MATERIALS
Fig. 3-1

	Model	L [cm]	P [cm]	H [cm]	Weight [kg]
	QUBE 65	88	64	55	52

PACKAGING DIMENSIONS AND WEIGHT
Tab. 3-1

3.2 Storage

CAUTION

To avoid unwanted damage to the system, make sure to store the box in a closed, dry place with a temperature between 5° and 35°C. Lower temperatures could lead to freezing of the fluid inside the watermaker, resulting in permanent failure.

The system cannot be stored for more than a year due to the evaporation of the fluid inside the watermaker, which causes the membranes to permanently deteriorate.

3.3 Components included in the box

The box contains the following components with their labels:

- Watermaker unit
- Activated carbon filter with solenoid valve
- Mesh filter
- Remote panel
- Installation kit
- Blue 6x8 production hose (5m)
- Pump unit
- Electronic Touch Control panel
- 5 micron filter with accumulator
- Non-return valve with Tee fitting
- Remote panel extension cable (10m)
- Filter removal key

The box also contains installation, operating and maintenance instructions and warnings.

3.4 Technical specifications of the system

Freshwater production	65 l/h ±15% (17.7 gal/h ±15%) @35ppm and 25°C
Membranes	2x SW-2521 membrane
Rejection	99.5% (nominal)
Power supply	12 V ±15% DC 24 V ±15% DC
Absorption - Power requirement	25 A ±15% - 300 W ±15% (12 V) 12 A ±15% - 300 W ±15% (24 V)
Pumps	1x Rotary pump
Pump pressure	7.8 - 8.2 bar
Pump flow rate	9.8 - 10.8 l/min
Inlet water temperature range	8 - 30 °C
Pre-filtration	1x 5micron 10 "x2-1/2" filter 1x Activated carbon filter 2-7/8" x 9-3/4"

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

3.5 Hydraulic connections

Pump unit / filters / non-return valve

Sea water inlet	Hosebarb DN16
Sea water outlet	Hosebarb DN16

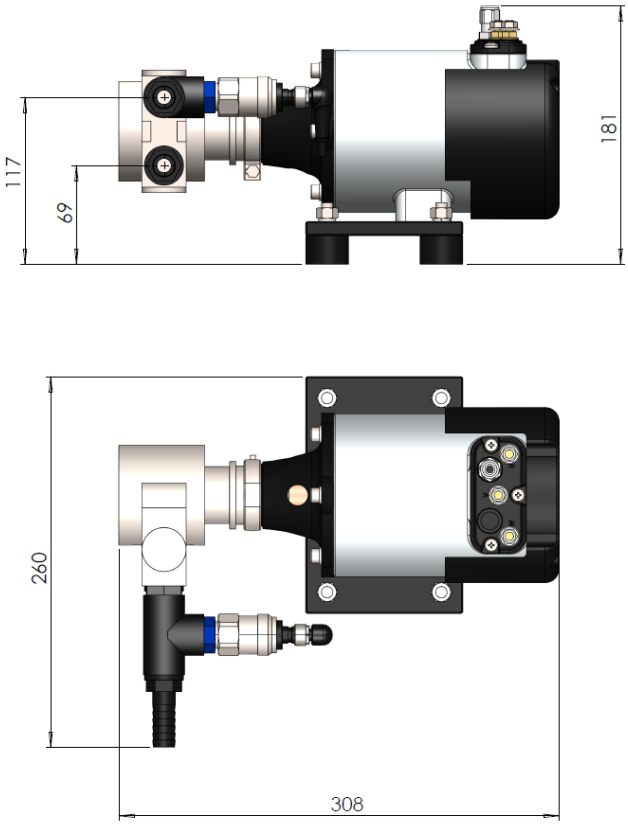
Watermaker

Sea water inlet	Hosebarb DN16
Concentrate outlet	Hosebarb DN16
Permeate outlet	¼" compression fitting for 6x8 hose

3.6 Weights and dimensions

3.6.1 PUMP UNIT

The weight of the pump unit is 6.7 kg (excluding the electrical box).

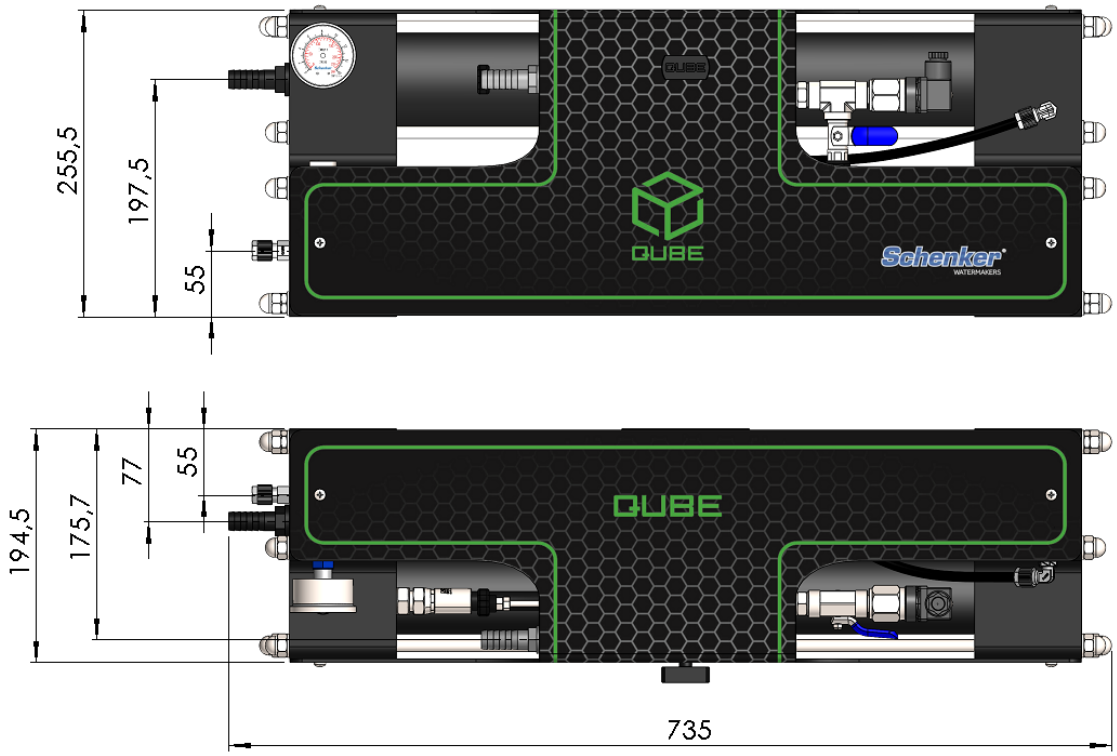


Dimensions are given in mm.

PUMP UNIT DIMENSIONS
Fig. 3-2

3.6.2 WATERMAKER

The weight of the watermaker is 26 kg.



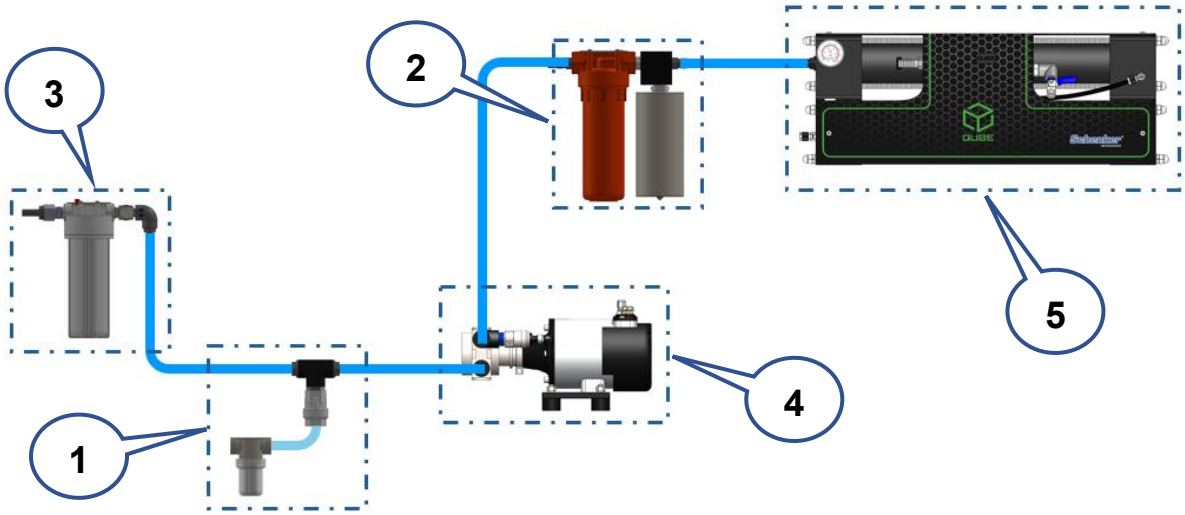
Dimensions are given in mm.

WATERMAKER DIMENSIONS
Fig. 3-3

3.7 Composition of the system

The system is divided into the following units:

1. Suction unit;
2. Sea water filtration unit;
3. Rinse fresh water filtration unit;
4. Pump unit;
5. Watermaker;
6. Computer box



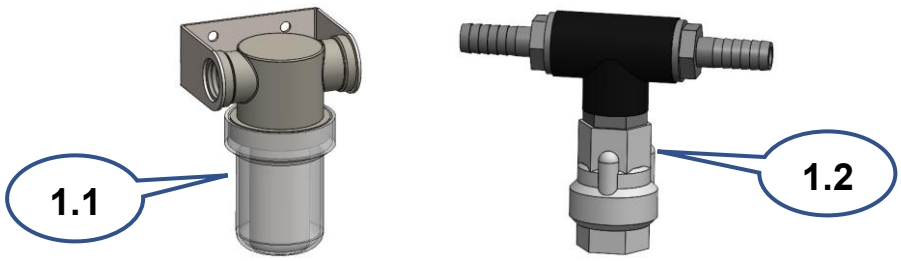
HYDRAULIC DIAGRAM OF THE SYSTEM
Fig. 3-4

3.7.1 Suction unit 1

Suction unit 1 consists of the following components:

1.1 Mesh filter

1.2 Non-return valve



FILTRATION UNIT
Fig. 3-5

THIS MANUAL BELONGS TO - Schenker Italia - ALL RIGHTS RESERVED

MESH FILTER: The function of the mesh filter, installed on the pump suction line, is to protect the pump from impurities that could damage the pump.

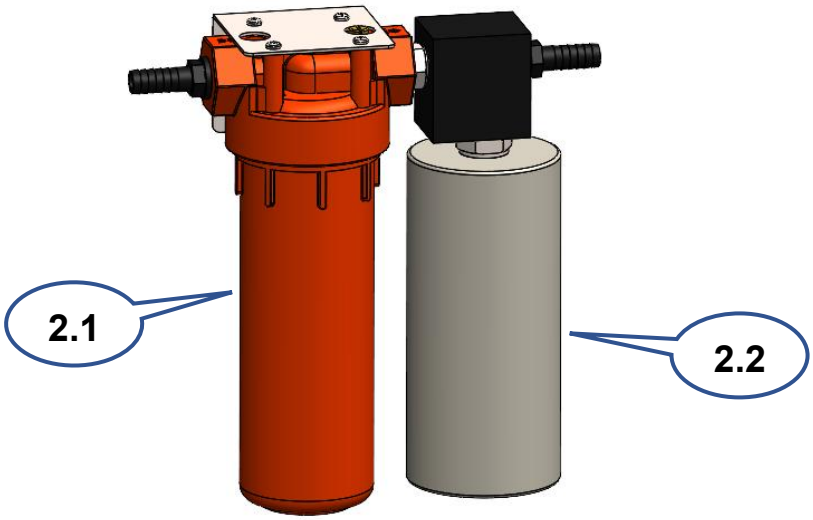
NON-RETURN VALVE: It has the function of preventing emptying of the suction pipes with consequent possibility of cavitation. It also prevents fresh water from escaping from the sea inlet during washing operations. **It must be installed vertically**.

3.7.2 Sea water filtration unit 2

The seawater filtration unit consists of the following components:

2.1 5 micron filter

2.2 Pressure accumulator



SEA WATER FILTRATION UNIT
Fig. 3-6

5 MICRON FILTER: It is a filter that serves to protect the watermaker from sediment and suspended impurities.

ACCUMULATOR: This is a black cylindrical vessel pre-filled with air, connected to the 5 micron filter, which has the function of dampening the pressure oscillations of the pump during watermaker cycling. The damper is factory-loaded at a pressure of approximately 5 bar.

THIS MANUAL BELONGS TO - Schenker Italia - ALL RIGHTS RESERVED

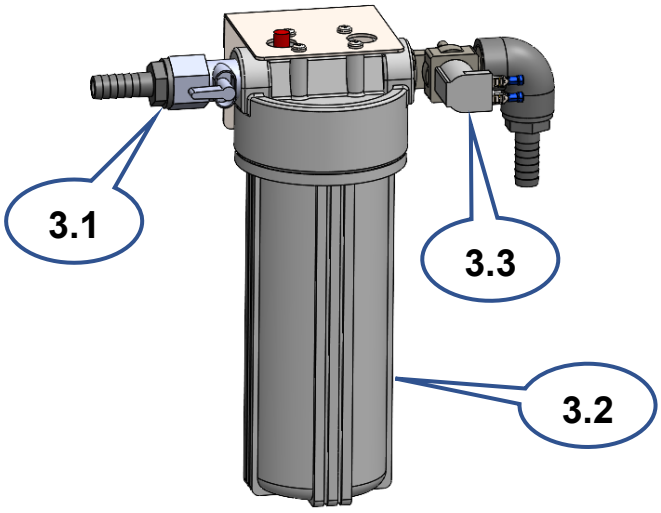
3.7.3 Rinse fresh water filtration unit 3

The seawater filtration unit consists of the following components:

3.1 Ball valve

3.2 Activated carbon filter

3.3 Solenoid valve



RINSE FRESH WATER FILTRATION UNIT
Fig. 3-7

BALL VALVE: Makes it possible to replace the activated carbon filter even when the autoclave* is active.

ACTIVATED CARBON FILTER: It is used to remove chlorine from the system's wash water as the chlorine in the fresh water in the tanks could damage the reverse osmosis membranes. Connect the autoclave installed on the boat to the side with the ball valve.

SOLENOID VALVE: Its function is to divert the pump suction from sea water to fresh water during washing operations.

*The autoclave is a system that increases the pressure of fresh water stored in the vessel's tank.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

3.7.4 Pump unit 4

The pump unit consists of:

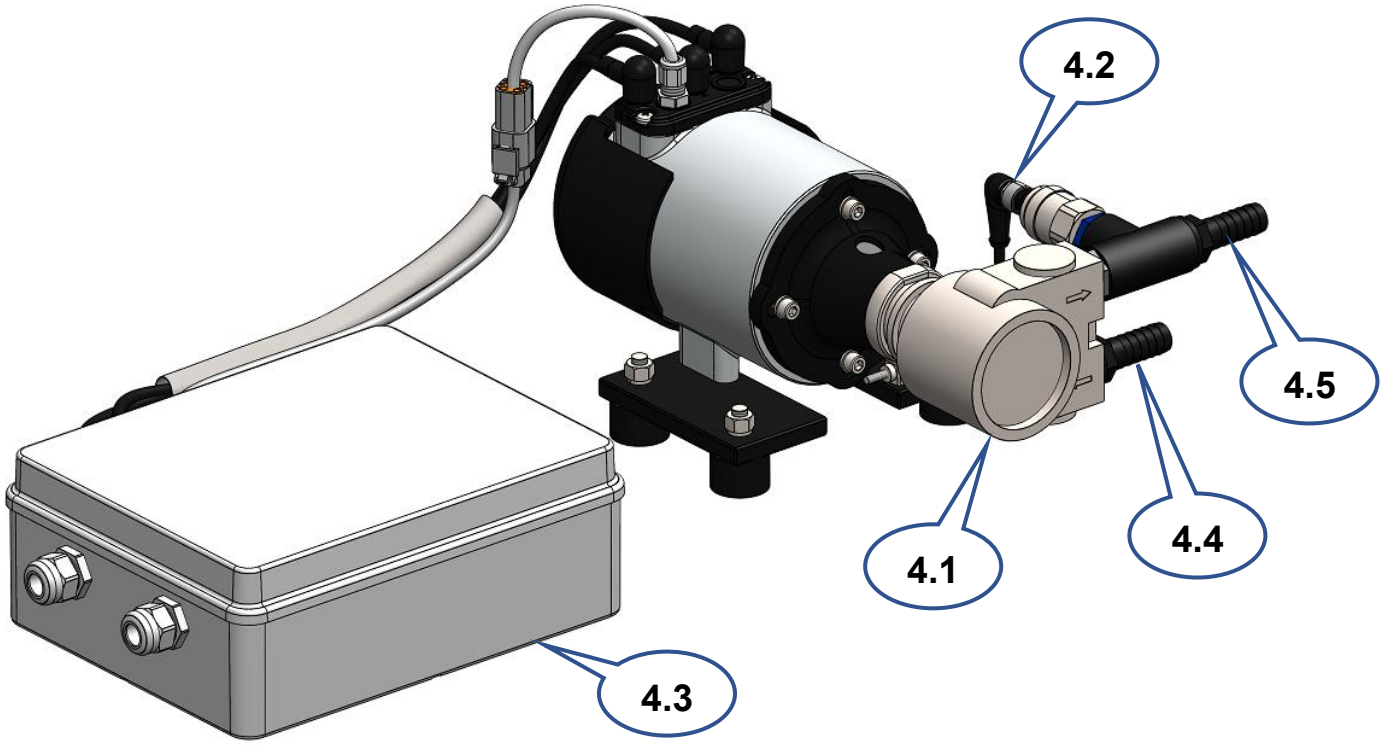
4.1 Rotary pump

4.2 Transducer

4.3 Electric pump box with controller

4.4 Pump unit inlet

4.5 Pump unit outlet (where the transducer is located)



PUMP UNIT 12/24 V
Fig. 3-8

PRESSURE TRANSDUCER: It is hydraulically connected to the pump unit. Switches the system off under the following conditions:

- If the outlet pressure of the pump unit exceeds the maximum threshold value of 11 bar;
- If the pressure coming out of the pump unit drops below the minimum threshold value of 2,5 bar;
- If the pressure at the outlet of the pump unit reaches an intermediate value between 2,5 and 4 bar after the minimum working pressure of 5,8 bar has been exceeded.

THIS MANUAL BELONGS TO - Schenker Italia - ALL RIGHTS RESERVED

3.7.5 Watermaker 5

The watermaker consists of:

5.1 Watermaker drain

5.2 Reverse osmosis membrane

5.3 Watermaker inlet

5.4 Freshwater production

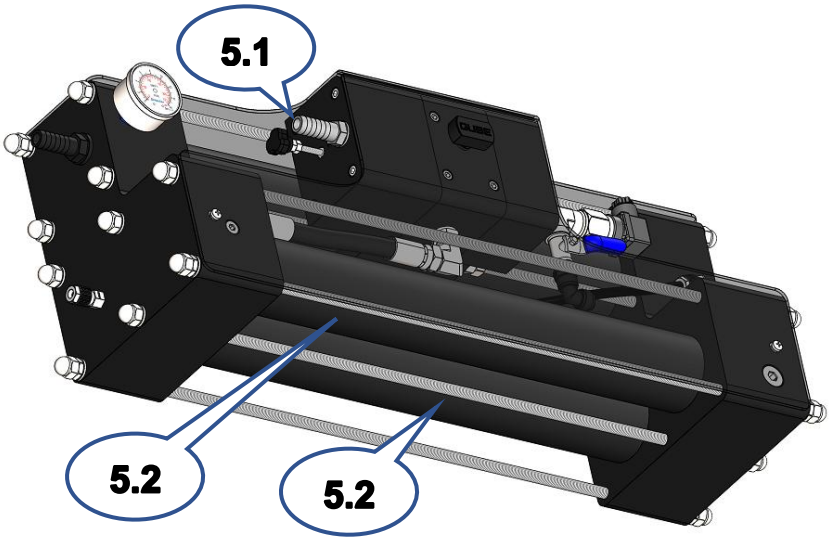
5.5 Reset valve

5.6 Depressurisation valve

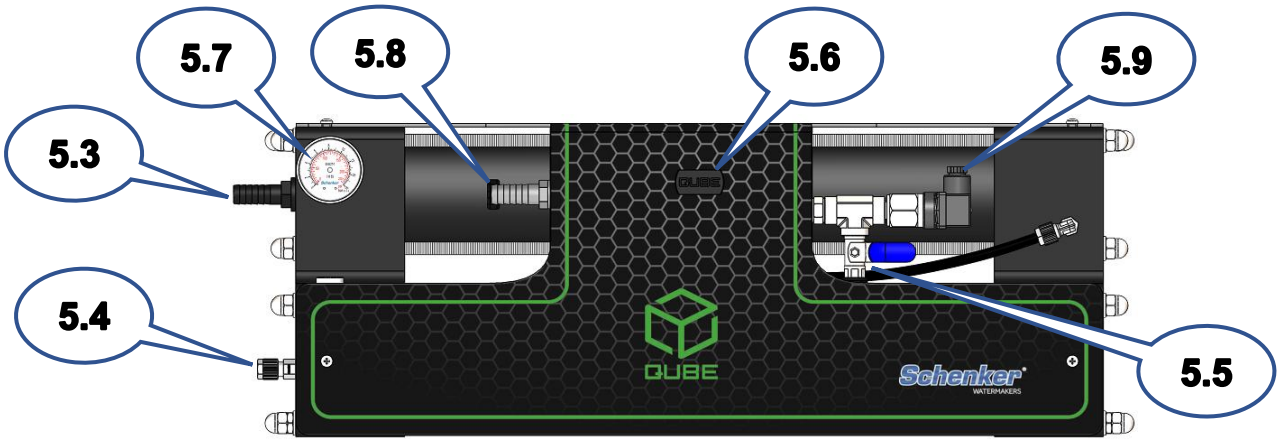
5.7 Pressure gauge

5.8 Positioner

5.9 Signal pressure switch



WATERMAKER (BOTTOM VIEW)
Fig. 3-9



WATERMAKER (FRONT VIEW)
Fig. 3-10

WATERMAKER DISCHARGE: Duct from which brine escapes, i.e. waste from the reverse osmosis process.

REVERSE OSMOSIS MEMBRANE: Installed inside the high-pressure carbon fibre container. The membrane type is SW2521 (2x). Its function is to separate the incoming high-pressure seawater into two streams: a salt water drain and a fresh water production drain.

WATERMAKER INLET: Water inlet duct.

FRESH WATER PRODUCTION: Duct from which the permeate, i.e. the fresh water produced through the reverse osmosis process, exits.

PRESSURE GAUGE: It is located on the upper left-hand side of the watermaker's front view and measures the incoming water pressure.

DEPRESSURISATION VALVE: It is only used in the air purge phase, at the first start-up of the system and during the reset procedure. Recognisable by the black knob, it is positioned on top of the ERS. Its function is to depressurise the system and allow air to be purged when the system is first started up. The valve must be closed under normal operating conditions, and slightly open during air purging operations.

POSITIONER: It serves to reset the system in the event of a block (see *Paragraph 5.5* or *6.5*).

RESET VALVE: It is installed on top of the ERS, and is recognisable by a small blue lever. The valve must be closed during normal operation (lever perpendicular to the valve body). This valve has the function of allowing the system to be reset in the event of a block. It must be opened by positioning the lever parallel to the valve body before acting on the valve positioner, as shown in the *Paragraph 5.5.*

SIGNAL PRESSURE SWITCH: Its function is to check that the machine shuts down properly, i.e. after cycling has taken place.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

3.7.6 Computer box 6

The computer box consists of:

6.1 Remote panel cable connector;

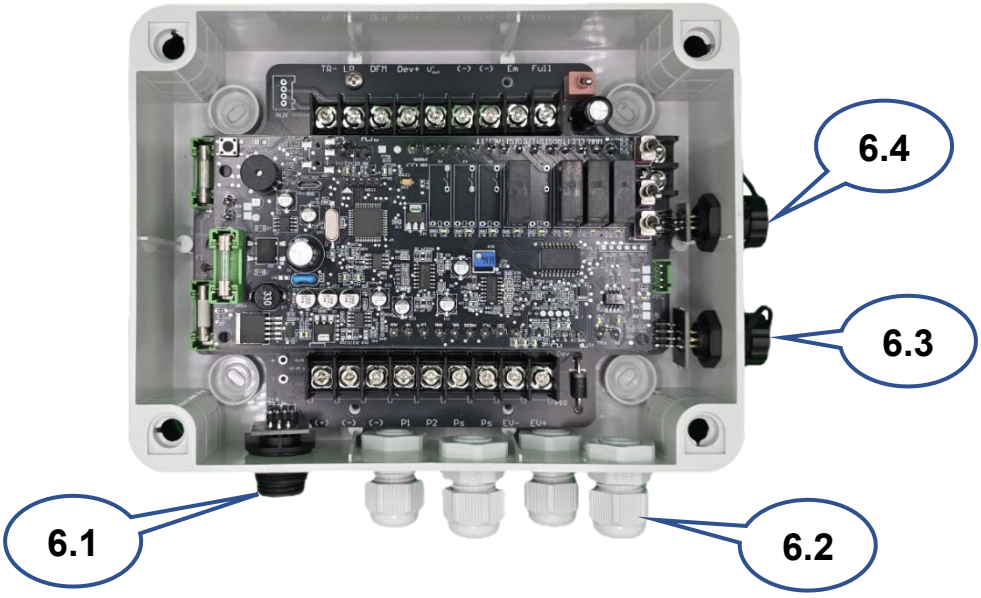
6.2 Electrical connections;

6.3 MFD interface system connector (optional);

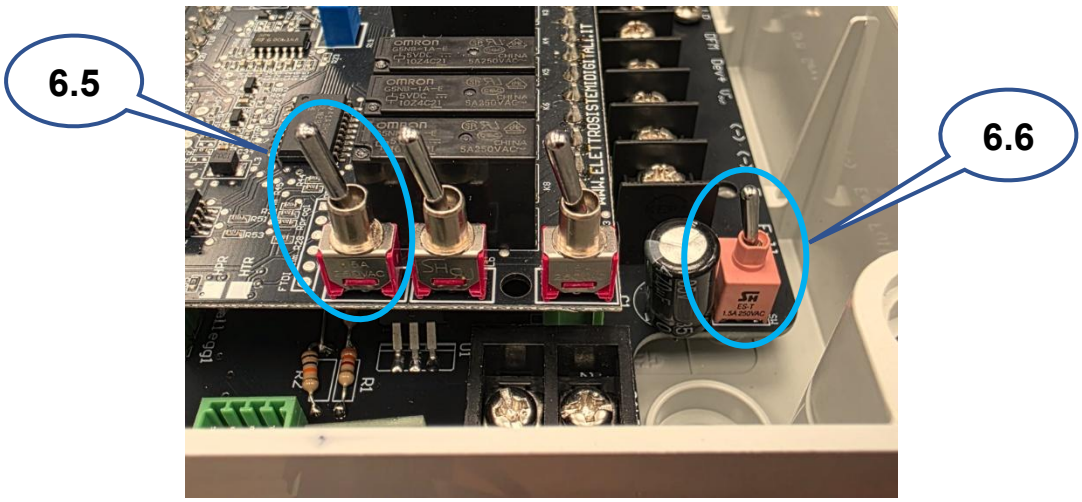
6.4 Pump unit connector;

6.5 Manual solenoid valve (EV) switch;

6.6 Pump unit manual switch (P).



COMPUTER BOX (TOP VIEW)
Fig. 3-11



EV - P SWITCHES (IN OFF POSITION)
Fig. 3-12

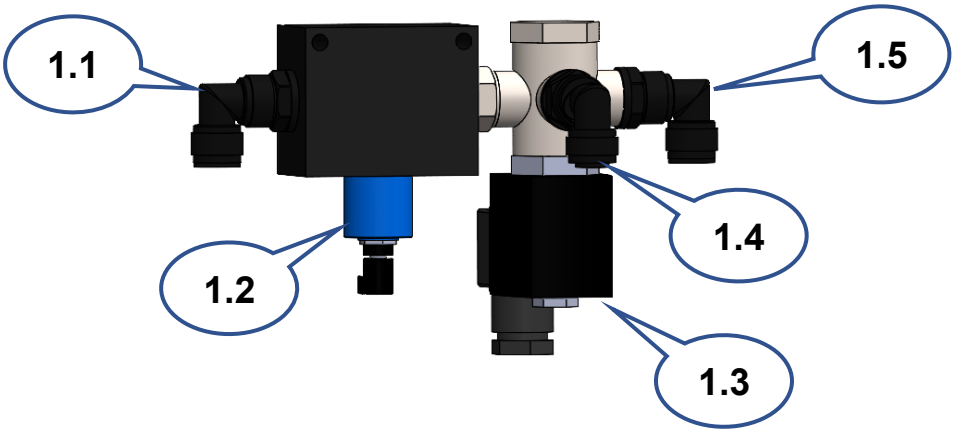
THIS MANUAL BELONGS TO - Schenker Italia - ALL RIGHTS RESERVED

It is an external unit and must be installed in an area relatively close to the watermaker (max. 2m) and must not come into contact with water. It is connected to the touch control panel and controls the functions of the watermaker. The P and EV switches allow you to directly activate the motor and the solenoid valve respectively. They can be used to start the system in case of electronics failure or in case of maintenance (see *Paragraph 8.1*).

3.8 Optional

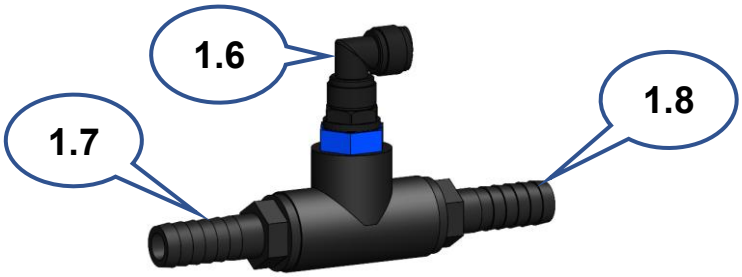
3.8.1 Diverter valve

It is a solenoid valve that diverts the flow of water produced by the watermaker depending on the value measured by a salinity probe, thus avoiding introducing water with unwanted characteristics into the collection tank. It comes with the drain tee fitting so you can connect the Watermaker drain to that of the OUT diverter valve.



DIVERTER VALVE
Fig. 3-13

1.1 IN - watermaker connection
1.2 Salinity probe
1.3 Solenoid valve
1.4 OUT - tank connection
1.5 OUT - drain connection

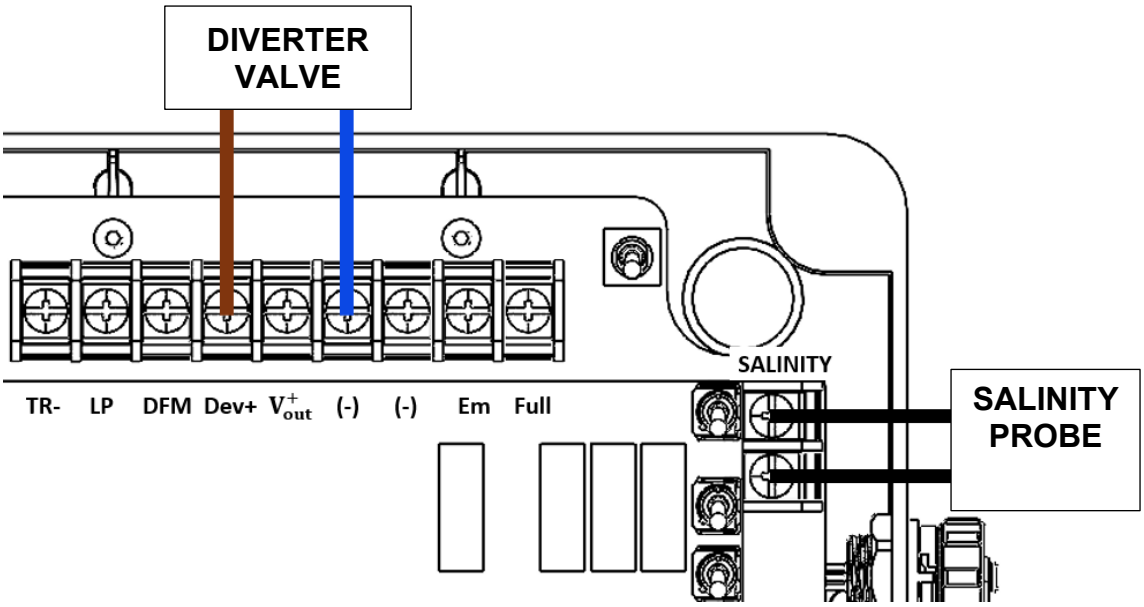


DRAIN TEE FITTING
Fig. 3-14

1.6 Rejected water drain
1.7 Off-board drain
1.8 Watermaker drain

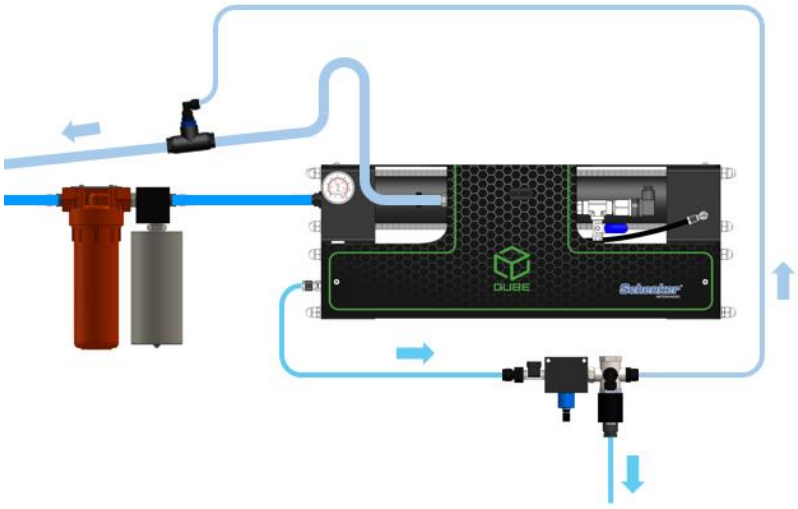
The connections to be made are as follows:

- **Diverter valve.** The brown cable must be connected to terminal ***DEV+*** and the blue cable must be connected to terminal ***(-)***
- **Salinity probe.** The two cables must be connected indifferently to the two ***SALINITY*** terminals.



DIVERTER VALVE CONNECTIONS
Fig. 3-15

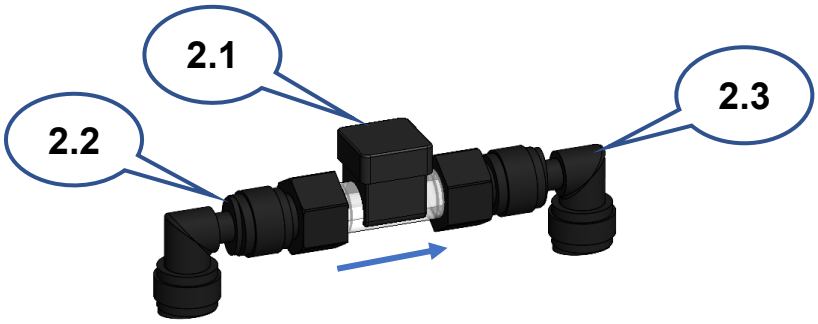
The diverter valve must be mounted downstream of the watermaker outlet.



DIVERTER VALVE INSTALLATION
Fig. 3-16

3.8.2 Digital flowmeter

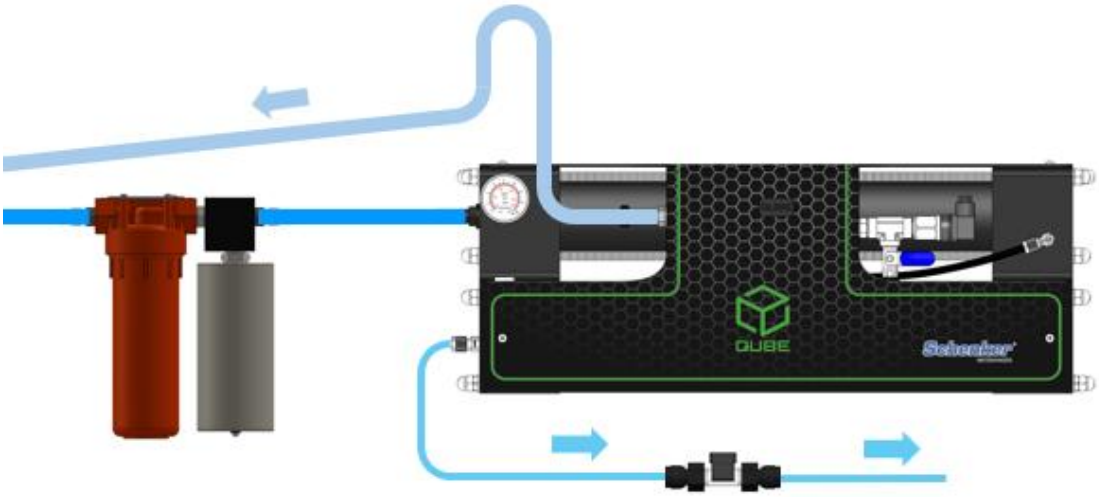
It measures the instantaneous flow rate of fresh water produced by the system and the value is shown on the touch-screen display.



DIGITAL FLOWMETER
Fig. 3-17

2.1 Digital flowmeter
2.2 Freshwater inlet
2.3 Fresh water drain

It must be installed at the outlet of the watermaker, making sure that the arrow indicated on the flow meter follows the flow of water.

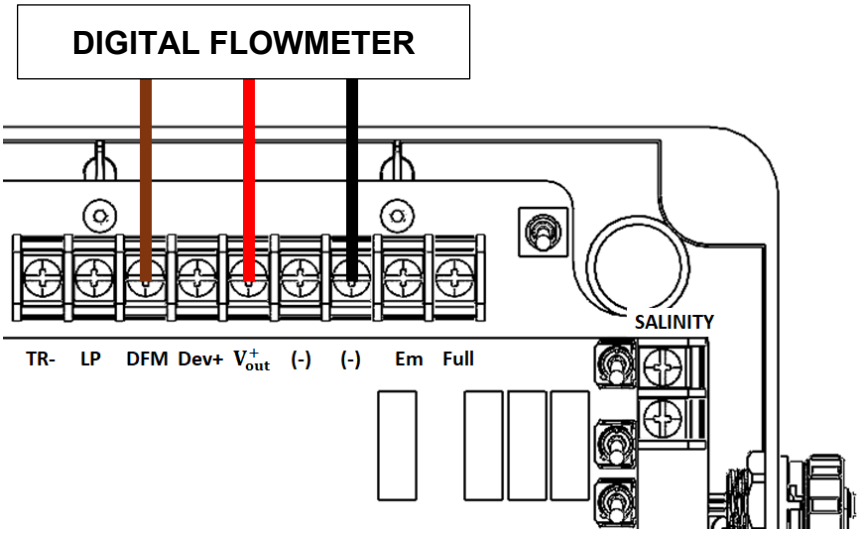


DIGITAL FLOWMETER INSTALLATION
Fig. 3-18

THIS MANUAL BELONGS TO - Schenker Italia - ALL RIGHTS RESERVED

The three cables of the digital flowmeter must be connected as follows:

- Red cable on terminal V_{out}^{+}
- Black cable on terminal ***(-)***
- Brown cable on terminal ***DFM***.

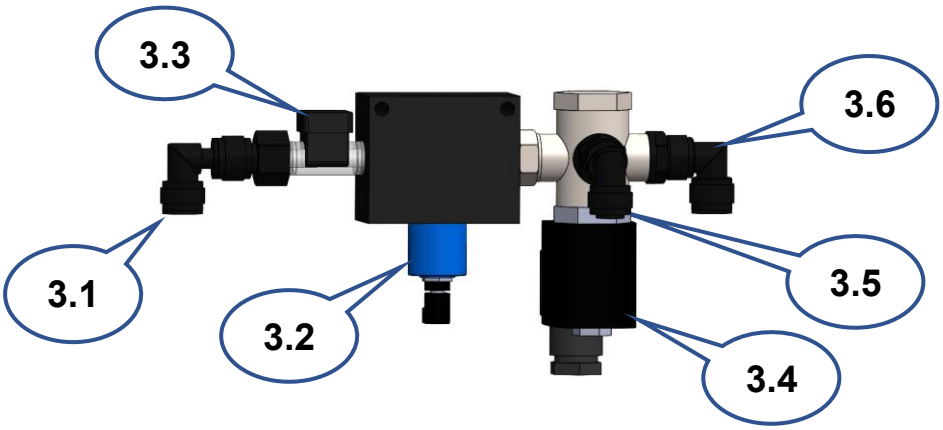


DIGITAL FLOWMETER CONNECTIONS
Fig. 3-19

CAUTION
DO NOT EXTEND THE CABLE SUPPLIED WITH THE DIGITAL FLOWMETER

3.8.3 Diverter valve + digital flowmeter

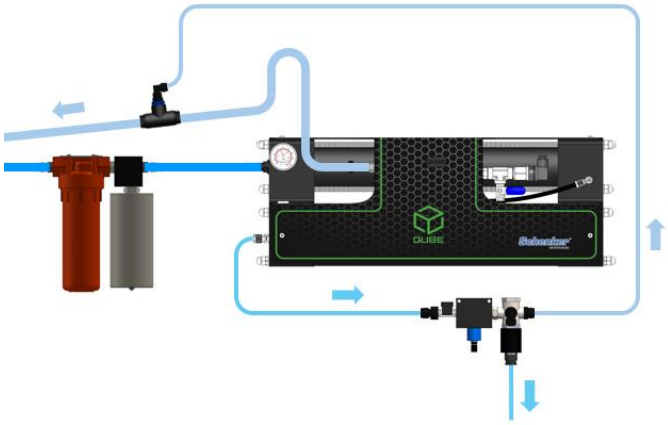
The diverter valve and digital flowmeter can be supplied together.



DIVERTER VALVE + DIGITAL FLOWMETER
Fig. 3-20

3.1 IN - watermaker connection
3.2 Salinity probe
3.3 Digital flowmeter
3.4 Solenoid valve
3.5 OUT - tank connection
3.6 OUT - drain connection

It must be installed at the outlet of the watermaker and the inlet is on the digital flowmeter side.



DIVERTER VALVE + DIGITAL FLOWMETER INSTALLATION
Fig. 3-21

For the electrical connections, refer to paragraphs 3.8.2 and 3.8.3.

CAUTION

To avoid unwanted damage to the system, make sure to store the box in a closed, dry place with a temperature between 5° and 35°C. Lower temperatures could lead to freezing of the fluid inside the watermaker, resulting in permanent failure.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

4. ASSEMBLY AND INSTALLATION

4.1 General criteria

Before starting installation work, it is important to carefully plan the task, carefully evaluating possible alternative solutions. The fundamental choices to be made are:

- Identification of the sea cocks and the necessary fittings;
- Location of the main units (pump unit, filtration units, watermaker);
- Location of the circuit breaker;
- Passage of pipes and electrical cables.

PRUDENCE

Carefully follow the general instructions below for correct installation of the system and to avoid problems caused by operating conditions other than those indicated:

- ***Install the sea inlet dedicated to the watermaker system only on the hull at the deepest point below the waterline, so that no air can be sucked in.***
- ***The non-return valve must be installed in a vertical position, below the waterline and as close as possible to the sea inlet***.
- ***The pump unit must be installed as low as possible below the waterline and as close as possible to the sea inlet. The length of the connecting pipe between the pump unit and the sea inlet*** must be less than 2m.
- ***The maximum temperature of the room where the watermaker is installed must be 40°C.***

PRUDENCE

The pump unit must be installed in a ventilated room, in order to facilitate cooling, and not subject to condensation or dripping.

4.2 Component assembly

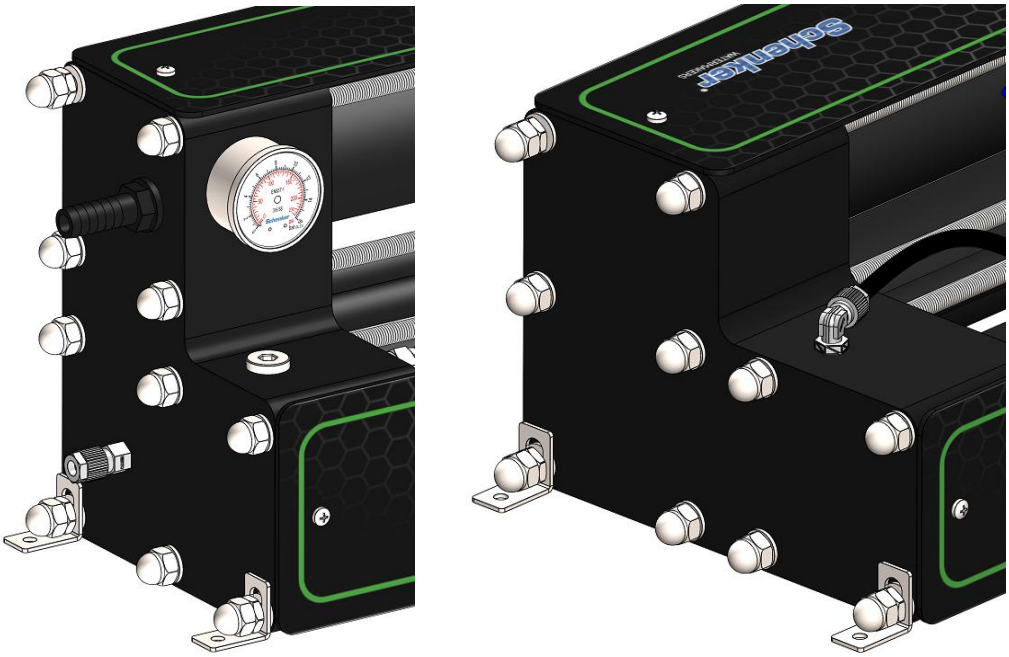
4.2.1 Pump unit

The pump unit must be installed below the waterline and as close as possible to the sea inlet. **The length of the connecting pipe between the pump unit and the sea inlet must be less than 2m**. **The pump unit cannot operate empty.** The pump unit must be installed in a ventilated area, in order to facilitate the cooling of its motor, and not subject to condensation or dripping. **The maximum temperature of the room where the pump is installed must be 40°C**. Do not install the pump where a possible water leak could cause damage to the vessel or compromise its safety. **The pump unit must be fixed on a flat horizontal surface and the pump head ducts must not be facing downwards.** so as to prevent it from emptying inside.

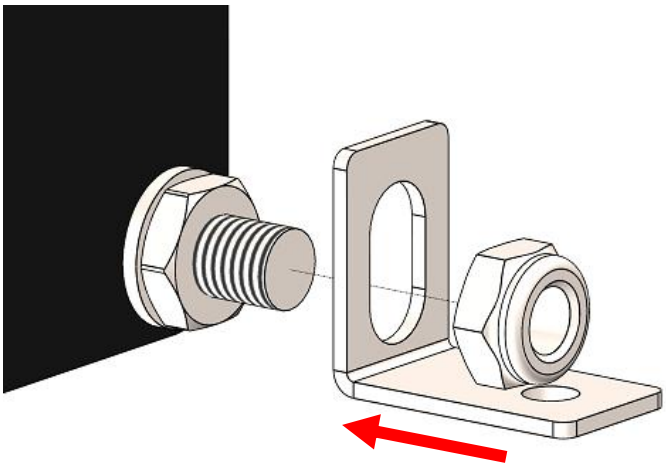
4.2.2 Watermaker

Install the watermaker above the pump. **The maximum temperature of the room where the watermaker is installed must be 40°C.** It can be placed on both surfaces opposite the cover. **The watermaker must be placed along its entire length on a flat surface**. **It is absolutely necessary to fix the rubber anti-vibration adhesive strip supplied in the package on the support surface of the watermaker.** Once the watermaker has been placed on the support surface, it must be blocked using the L-brackets supplied in the installation kit. **In no case should the watermaker be installed in a "suspended" manner, using only the L-brackets without placing the watermaker firmly on a flat surface.**. **If wall installation is required, a support bracket must be provided to take the weight of the watermaker**.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

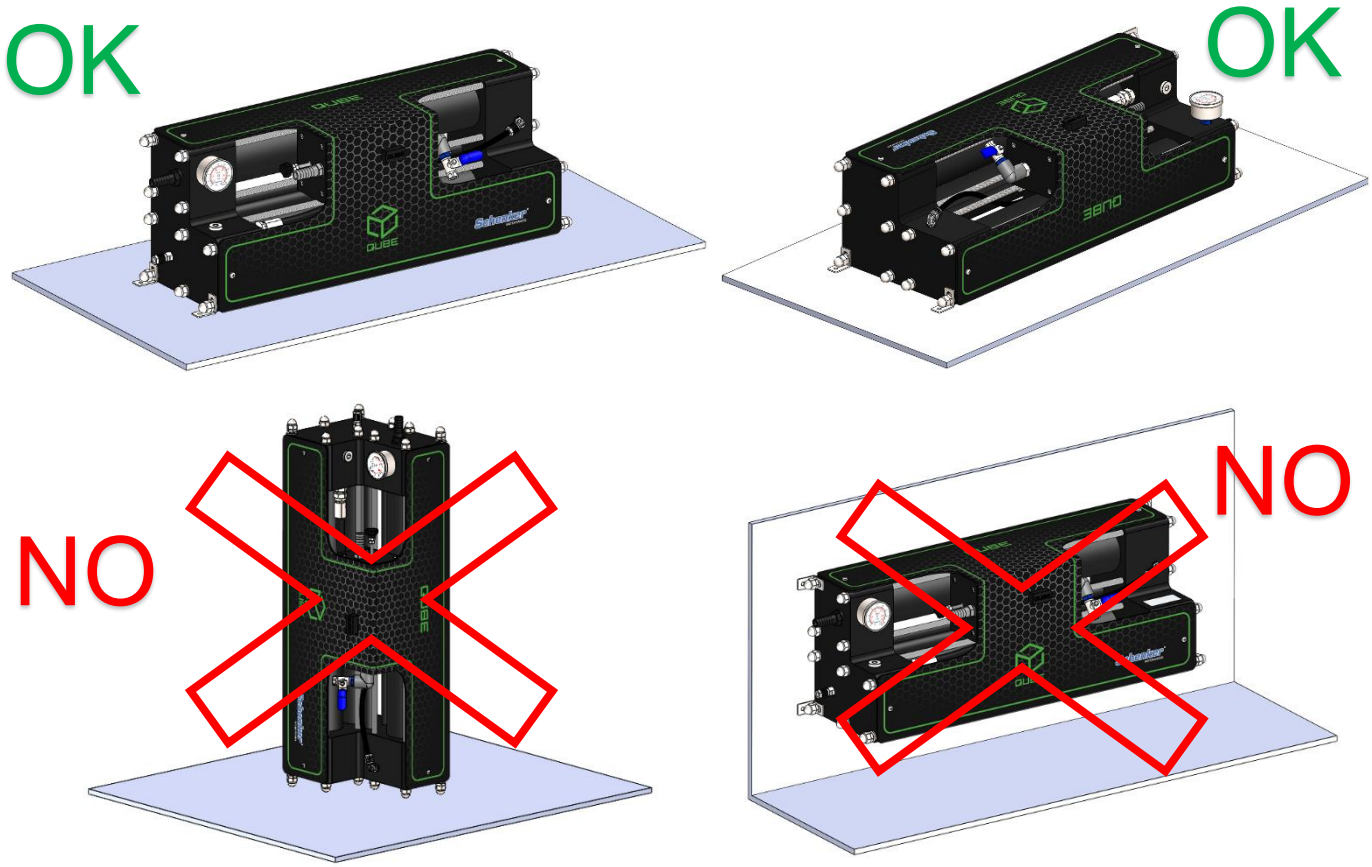


VERTICAL AND HORIZONTAL INSTALLATION
FIG. 4-1

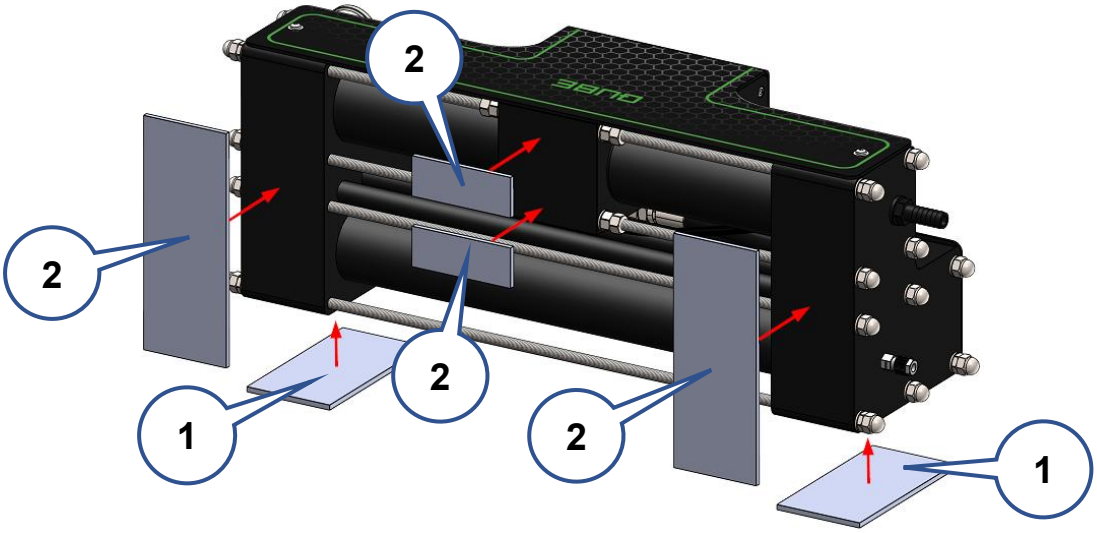


ASSEMBLY PROCEDURE
Fig. 4-2

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED



INSTALLAZIONI POSSIBILI
Fig. 4-3



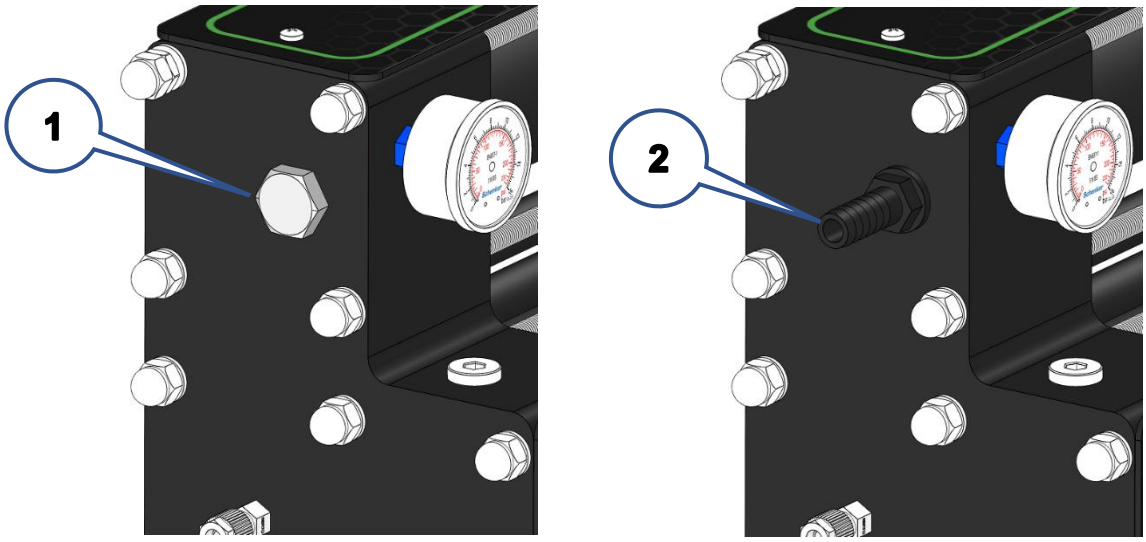
POSITION OF ADHESIVE ANTI-VIBRATING STRIPS
Fig. 4-4

1 Vertical installation **2** Horizontal installation

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

CAUTION
Failure to follow the assembly instructions and resulting incorrect installation may result in damage to the watermaker.

A cap (1) is fixed on the right end of the watermaker. This cap must be removed with the help of a size 27 spanner and replaced with a hosebarb (2) supplied in the installation kit, which must be tightened to the mechanical stop with a size 22 spanner.



SEA WATER INLET INSTALLATION
Fig. 4-5

1 Cap **2** Inlet hosebarb

4.2.3 Filtration units

The non-return valve must be installed in a vertical position, as close as possible to the sea inlet, below the waterline and the pump unit:

NON-RETURN VALVE POSITIONING
Fig. 4-6

The activated carbon filter and the 5 micron filter must be placed on an easily accessible vertical wall, leaving enough space underneath to unscrew the container.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

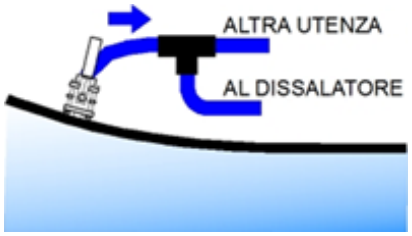
4.3 Installation

4.3.1 Water inlets and drains

The following hydraulic connections are required for proper installation of the watermaker:

- Sea water inlet;
- Fresh water intake for flushing;
- Water discharge.

4.3.2 Sea water inlet

Dedicated sea inlet	A dedicated 3/4” inlet, installed centrally on the hull, which does not draw air under any conditions, is the ideal solution. To facilitate suction, it is recommended to place a suction shell under the inlet with the grate facing forward. For fast boats (over 15 knots) it is recommended to drill holes in the rear part of the shell, to ensure proper water intake during navigation.	Size 3/4"
Derivation from shared sea inlet (alternative)	Alternatively, the sea water inlet can be shared with other utilities (air conditioning, generator, bilge pumps, sea water pumps, etc.) provided that the following requirements are met, in addition to those already indicated for the dedicated inlet: - The sea water inlet must be sized to allow the simultaneous operation of the connected utilities; - It must not draw air from other utilities ***PRUDENCE*** ***Do not use the branches from the engine cooling water inlet.***	

CAUTION

- The hose connections, especially if below sea level, must be secured with double clamps.
- The mesh filter must be installed near the inlet in an accessible place so that it can be easily inspected. The mesh filter must be 50 mesh. Check that the sea inlet is not clogged by algae and waste collected during navigation.
- The sea inlet, whether dedicated or shared, must be located far from the vessel's toilet drains and must always be submerged, even when the boat heels.

4.3.3 Fresh water intake for flushing

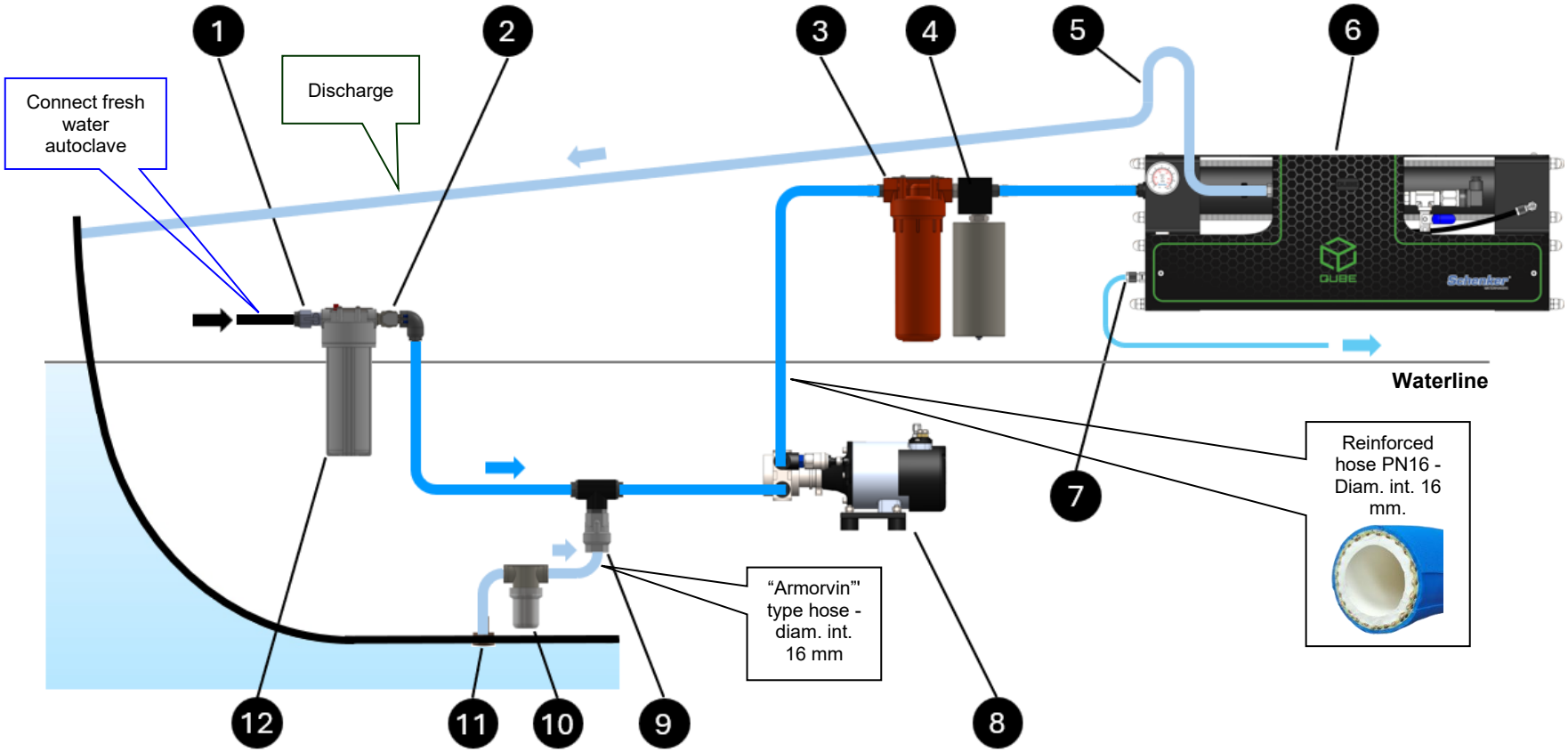
Fresh water intake for flushing	It is necessary to use a branch obtained downstream of the vessel's sanitary water pressurisation system (autoclave). The following conditions must be met: • The autoclave must have a minimum flow rate of ***8 l/min at 1 bar.***	***The autoclave must have a minimum flow rate of 8 l/min at 1 bar.***

4.3.4 Water discharge

Water discharge	The drainage inlet must have a minimum size of ½" and should preferably be above sea level.	**Minimum size ½'**
Branch from existing drains (alternative)	It is possible to use branches from existing devices, provided that they do not involve the engine cooling water drain or utilities that discharge at high pressures.	

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

4.4 Hydraulic connections



HYDRAULIC CONNECTIONS AND HOSES
Fig. 4-7

1 Autoclave water shut-off valve
2 Solenoid valve
3 5 micron filtration unit
4 Pressure accumulator
5 Gooseneck
6 Watermaker
7 Fresh water production outlet
8 Pump unit
9 Non-return valve
10 Mesh filter
11 Sea inlet
12 Activated carbon filter

NOTE
The watermaker does not necessarily have to be positioned above the waterline but should be above the pump unit.

All hydraulic connections (except for fresh water production) must be made with 16mm internal diameter rubber hose and a ½" hosebarb.

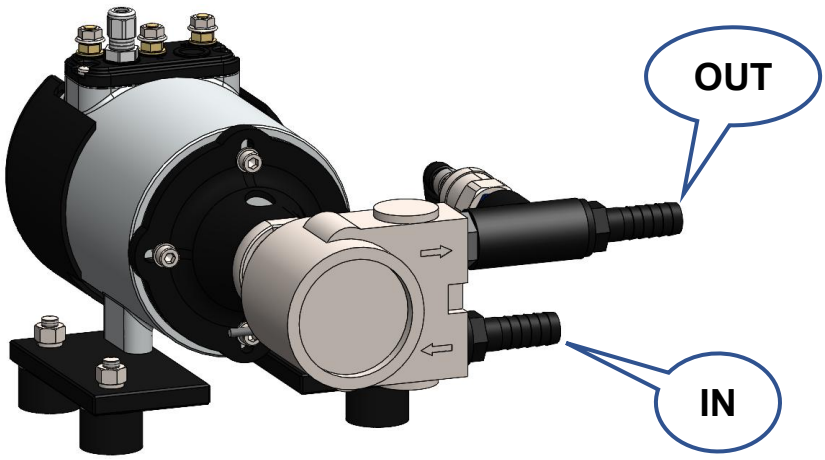
The hydraulic connections are:

Low pressure connections - max 3 bar	• Sea water inlet connection - mesh filter - non-return valve inlet - pump unit.	**"Armorvin"' type hose with internal helix PN6 Cross-section: diam.int.16mm**
	• Watermaker drain connection.	**"Armorvin"' type hose with internal helix PN6 Cross-section: diam.int.16mm**
Medium pressure connections - max. 11 bar	• Connection of autoclave – activated carbon filter – non-return valve – pump inlet • Pump outlet connection - 5 micron filter - watermaker inlet.	**Reinforced hose minimum PN16 Cross-section: diam.int.16mm**
Low pressure connections - max 3 bar	• Watermaker - fresh water tank.	**¼" fittings, blue plastic tube 6x8mm supplied**

CAUTION
An inadequate hose between the pump unit and the watermaker can explode and endanger the safety of the vessel.

4.4.1 Pump unit connections

Connect the inlet and outlet hoses according to the 'Sea water INLET' indication on the support base.



PUMP UNIT INLET AND OUTLET
Fig. 4-8

CAUTION
The pump must be installed as close as possible to the sea inlet and as low as possible below the waterline; Furthermore, long and winding hose routes are not recommended. It must also be positioned on a flat, horizontal surface and the pump head ducts must not be facing downwards to prevent it from emptying inside.

4.4.2 Watermaker connections

WATERMAKER INLET (Water inlet from the pump): The hosebarb to be used for the water inlet of the feed pump is the one positioned on the left flange (marked **IN**).

WATERMAKER DISCHARGE (OVERBOARD DISCHARGE): The hosebarb to be used for connecting the drain is the one located on the left valve of the watermaker (marked **OUT**).

CONNECTION TO THE FRESH WATER TANK: The connection to the fresh water tank must be made using the blue tube supplied in the package, to be connected to the grey compression fitting located on the left flange of the watermaker and to a ¼” connection located on the top of the fresh water tank, if available. If this fitting is not available, in the case of a metal tank, it is possible to make a ¼” threaded hole where the supplied male fitting can be connected. Another option is to make a Tee-junction on the tank’s air exhaust duct

4.5 Electrical connections

CAUTION

These operations must be carried out by a qualified technician, using the electrical connection drawings provided in this manual as reference.

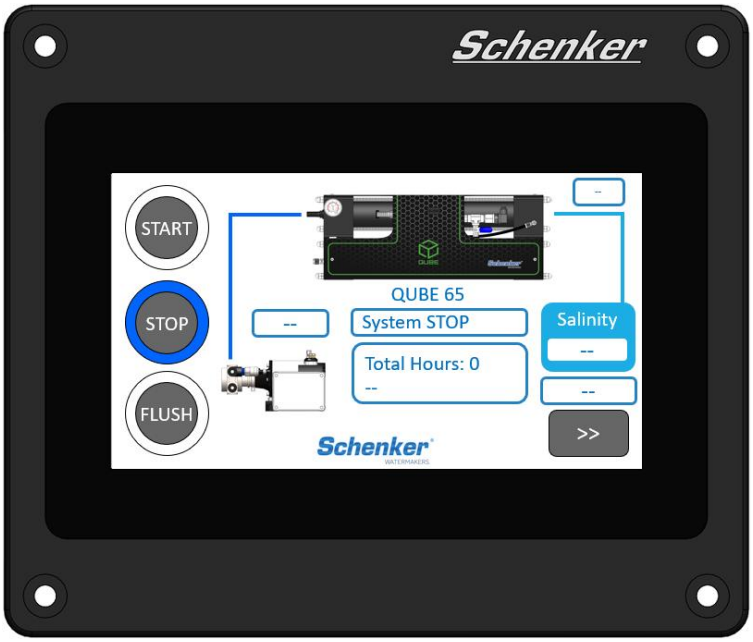
4.5.1 Mounting the control panel

The remote panel has the following dimensions: ***Width 135 mm - Height 116 mm***

It can be recessed on any panel of the boat's cladding, provided that the area behind it is free from humidity and condensation and there is sufficient depth to contain the rear part of the panel (approximately 50mm).

The cut to be made to recess the remote panel has the following dimensions: ***Width 110 mm - Height 90 mm***

The remote panel is connected via the special extension cable supplied with the watermaker (standard length 10m). The installation distance can be increased by using an additional extension cable.



CONTROL PANEL
Fig. 4-9

4.5.2 Electrical connections: wiring

The electrical connections are located inside the electrical box on the pump unit. The 12/24 V power connection, coming from the service batteries, must be made on the *"12/24V"* and *"GND"* terminals. A circuit breaker with a tripping current of 63 A for systems powered by 12 Volts or 32 A for systems powered by 24 V must be installed on this line. The circuit breaker is indicated on the wiring diagram with the following symbol:

The cross-section of the power cable must be proportional to the cable length. It is suggested to take the following table as a reference:

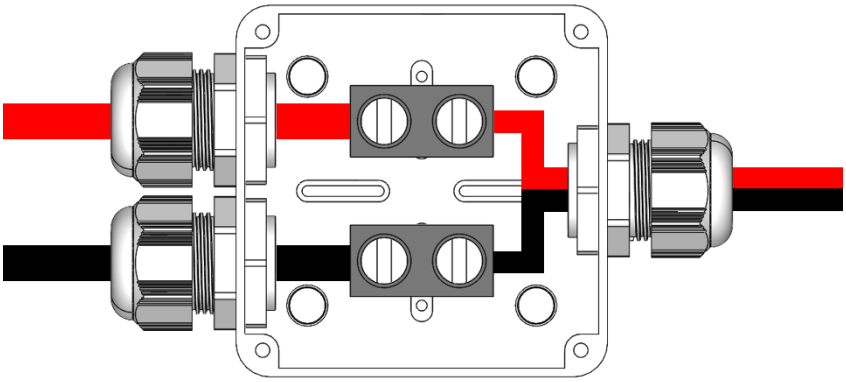
Voltage	Circuit Breaker	Cable cross-section depending on length (out + in)					
		Up to 3 metres		3 - 7 metres		7-10 metres	
Volt	Ampere	mm^2	AWG*	mm^2	AWG*	mm^2	AWG*
12	**63**	**16**	**5**	**25**	**5**	**25**	**3**
24	**32**	**10**	**7**	**16**	**5**	**16**	**5**

AWG (American Wire Gauge) is a standardised system for measuring the diameter of electrical wires.

NOTE
The cable length refers to the length of the circuit (positive + negative).

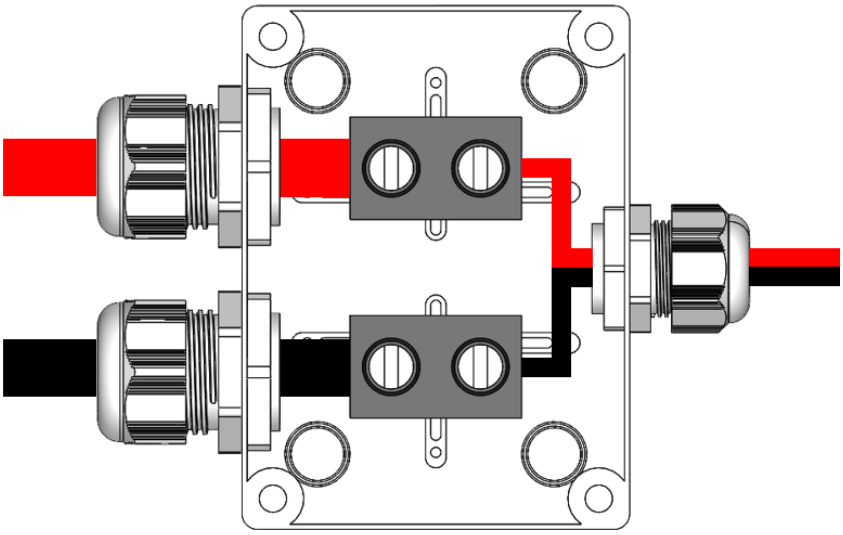
If it is necessary to use power cables with a cross-section greater than $10\ mm^2$ it will not be possible to connect them inside the electrical box provided. An additional electrical box must therefore be installed **which must be a maximum of 15 cm away from the electrical box of the pump unit.** The cable coming out of the additional box must have a cross-section of $10\ mm^2$. The following instructions must be followed when installing the additional box:

- **$16\ mm^2$ cable cross-section:**
  - 1x IP65 box 100x100x50
  - 3x PG21 cable gland
  - 3x Hexagonal lock nut PG21
  - 2x 1P terminal block for cable with 16 mm^2 cross-section.



ELECTRICAL BOX DIAGRAM CABLE CROSS-SECTION 16 MM^2
Fig. 4-10

- **25 mm^2 cable cross-section:**
  - 1x IP65 box 150x110x70;
  - 2x PG29 cable gland;
  - 2x Hex Lock Nut PG29;
  - 1x PG21 cable gland;
  - 1x Hexagonal lock nut PG21
  - 2x 1P terminal block for cable with 25 mm^2 cross-section.



ELECTRICAL BOX DIAGRAM CABLE CROSS-SECTION 25 MM^2
Fig. 4-11

Regarding the connection of the solenoid valve, the following cable cross-section must be used:

Electrical connector	*Connect to:*	*Cable cross-section*
EV-	Solenoid valve on the activated carbon filter	1 mm^2
EV+		1 mm^2

NOTE:
The solenoid valve cables can be connected to either EV+ or EV-.

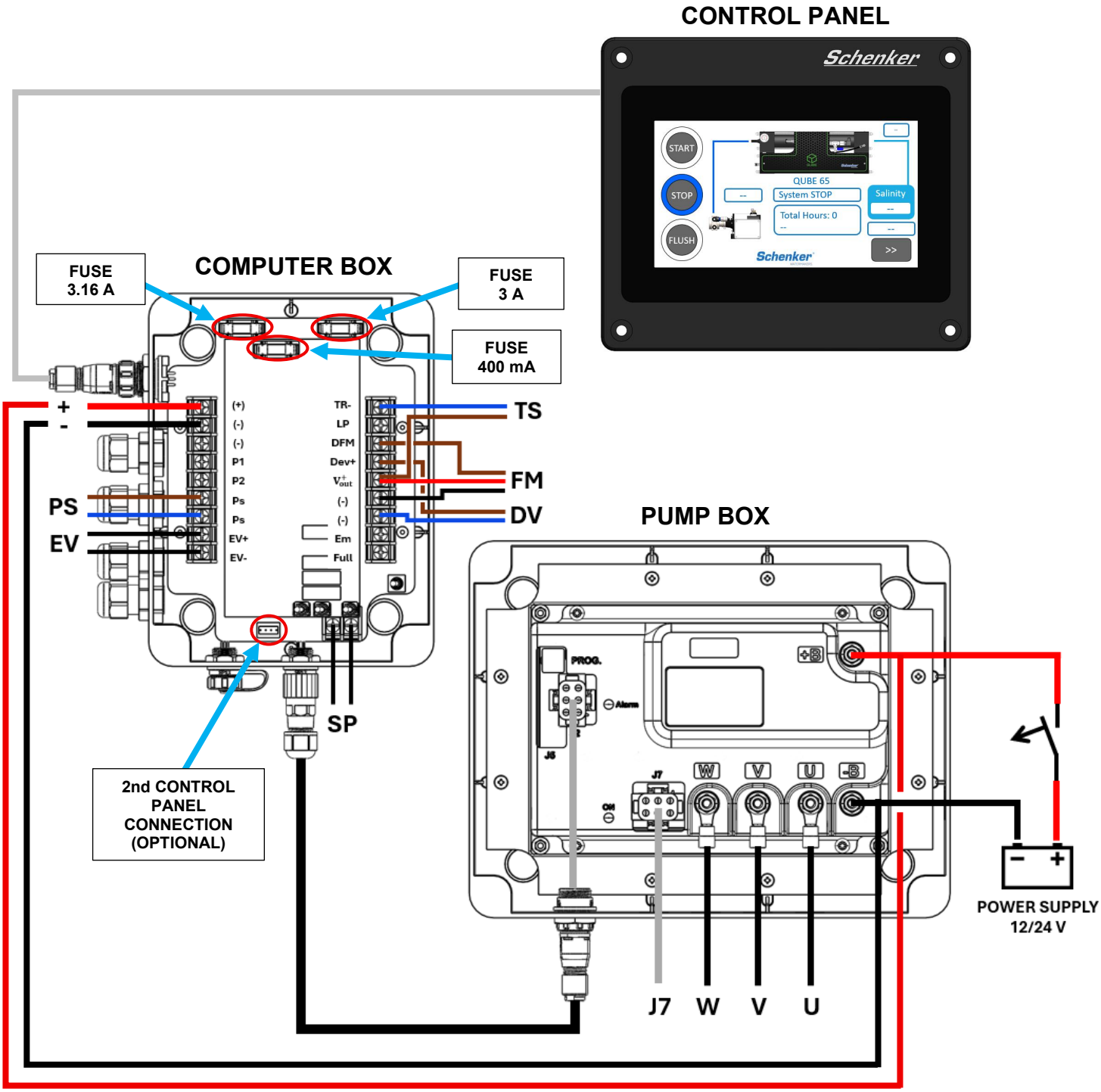
Microswitches on the board inside the electrical box allow the individual pumps of the pump unit and the solenoid valve to be operated. They can be used to operate the watermaker in an emergency. Under normal operating conditions they must be in the OFF position.
The tripping current of the fuse on the board inside the electrical box is 400mA.

Level switches can also be connected to the system inside the computer box so as to interrupt the system when the tank has reached a certain filling level and reactivate it as soon as the level drops below a certain threshold. The following connections are made inside the computer box:

Electrical connector	*Connect to:*
Em	Level switch normally open (empty tank)
(-)	
Full	Level switch normally closed (full tank)
(-)	

CAUTION
When the system is started via the microswitches all safety controls are deactivated; Therefore, the system is operating under unsafe conditions and must be continuously monitored.

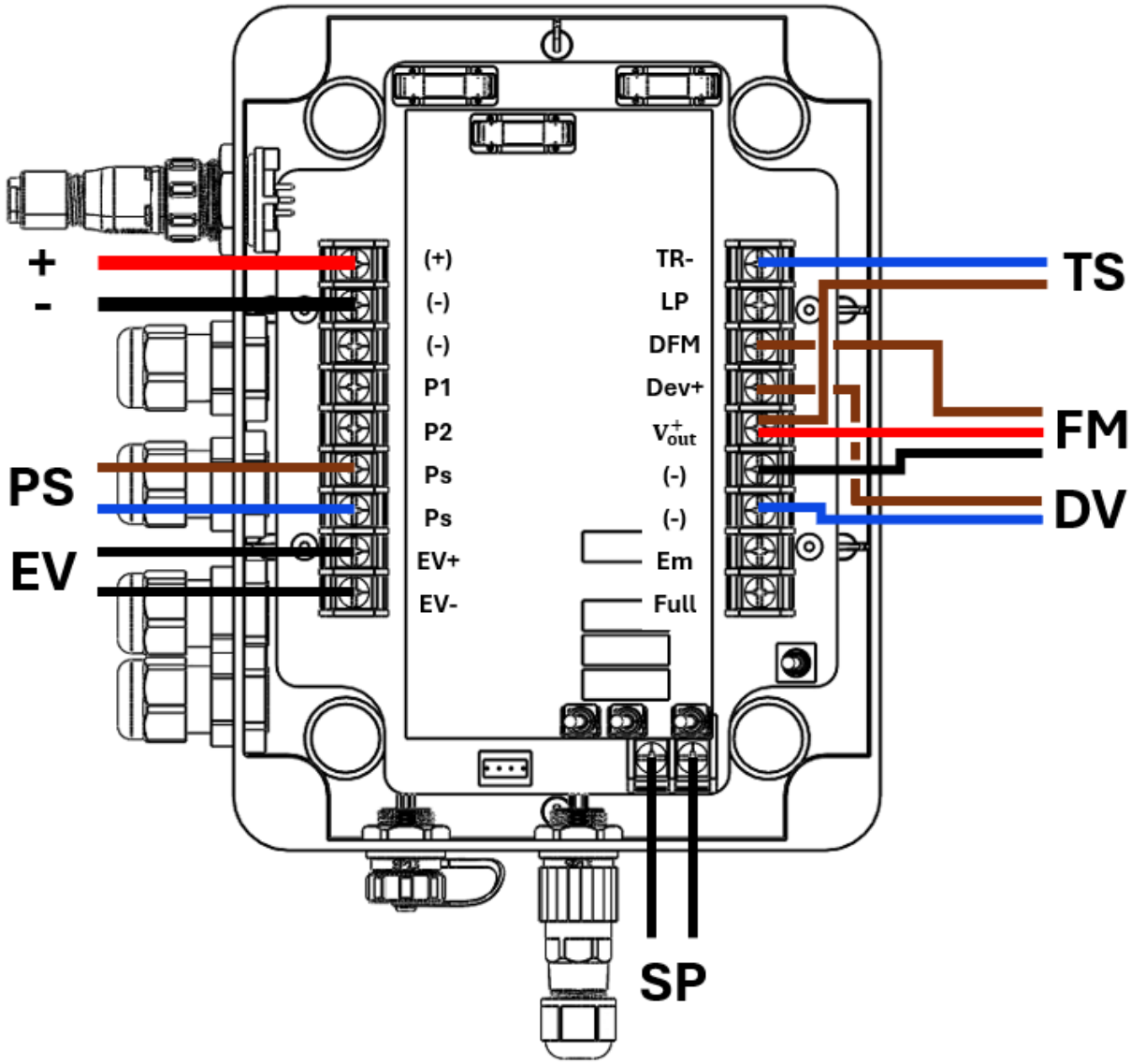
THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED



+, -: Power supply
PS: Pressure switch
EV: Solenoid valve
SP: Salinity probe (optional)

TS: Transducer
FM: Flowmeter (optional)
DV: Diverter valve (optional)
J7, W, V, U: Electric motor connections

12/24V DC WIRING DIAGRAM
Fig. 4-12



+, -: Power supply
PS: Pressure switch
EV: Solenoid valve
SP: Salinity probe (optional)

TS: Transducer
FM: Flowmeter (optional)
DV: Diverter valve (optional)

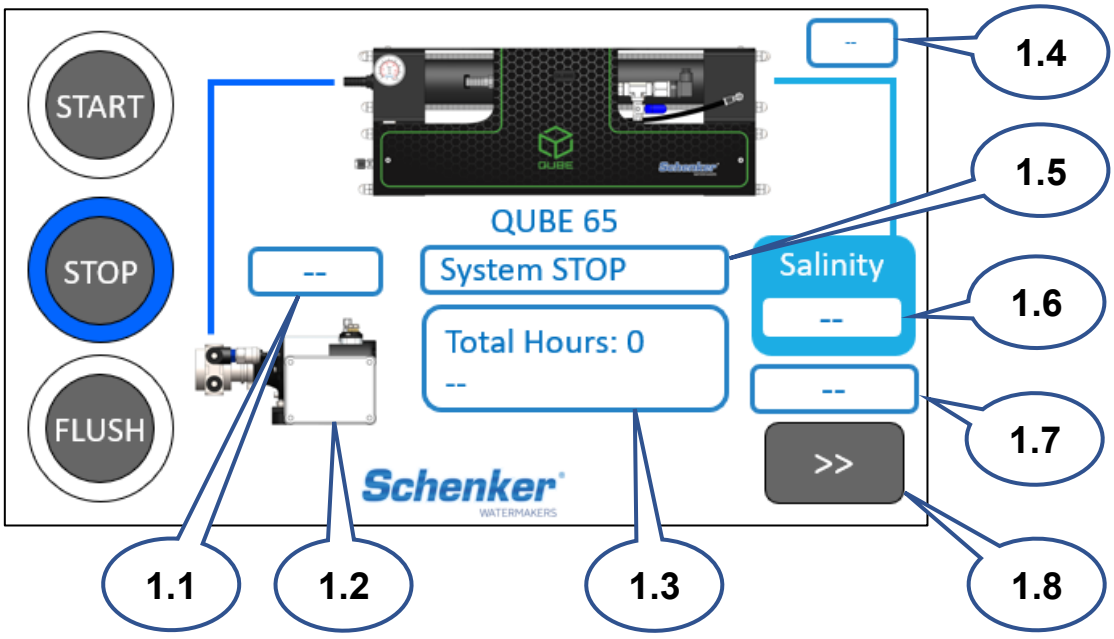
COMPUTER BOX DIAGRAM
Fig. 4-13

5. OPERATION AND USE

5.1 Description of controls

The control panel has three pages.

5.1.1 Page 1 (Main screen)



PAGE 1 - MAIN SCREEN
Fig. 5-1

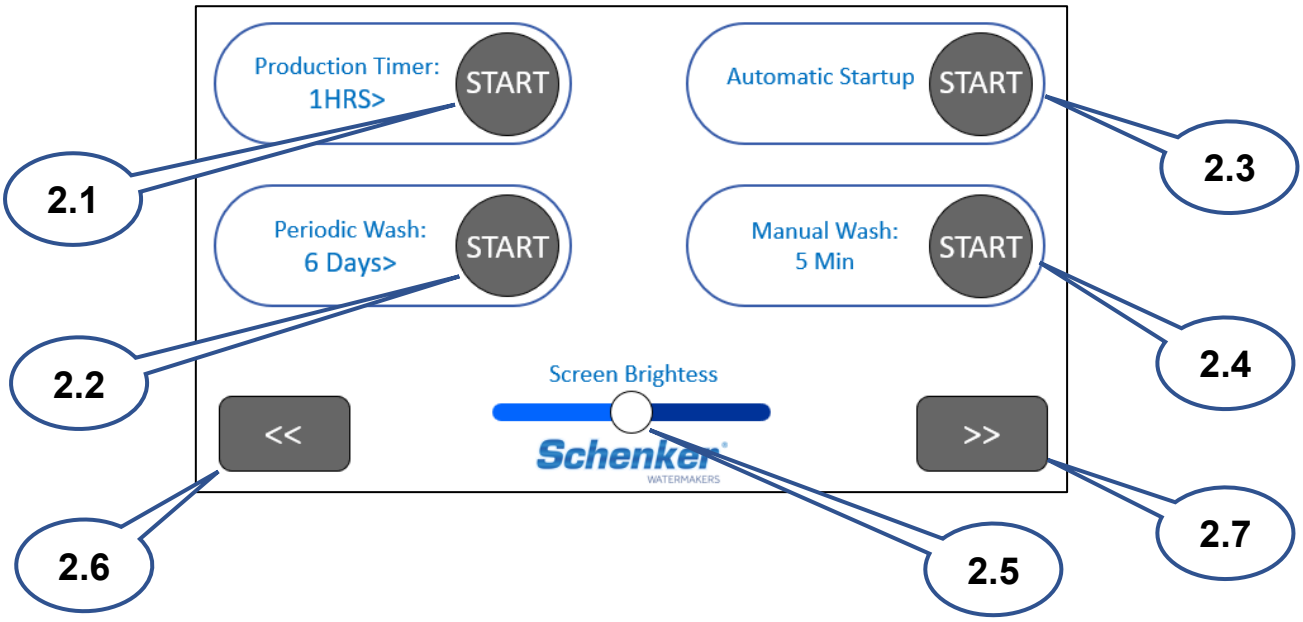
No.	Function	Possible states
1.1	Supply voltage	12 / 24 [V]
1.2	Pump status	ON / OFF
1.3	Timer	Total operating hours / Total litres produced
1.4	Pressure reading	Inlet pressure [bar/psi]
1.5	System status	Warnings / Alarms
1.6	Salinity control (optional)	OK / MED / BAD /WAIT
1.7	Production control (optional)	Fresh water produced [l/h / gal/h]
1.8	Next page	-

On the main screen you can monitor the status of the system and perform the following functions:

- **START**: Pressing the *START* button will cause the system to run continuously until the *STOP* button is pressed.
- **STOP**: Pressing the *STOP* button switches the system off. The switch-off is not immediate in order to give the internal valves time to position themselves correctly (about 2/3 seconds). If the STOP button is pressed for about 5 seconds, the system will immediately be forcibly switched off.
- **FLUSH**: Pressing the *FLUSH* button books flushing, whose duration is 90 seconds, which will be carried out as soon as the *STOP* button is pressed.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

5.1.2 Page 2



PAGE 2
Fig. 5-2

No.	Function	Possible states
2.1	Production timer	1 to 6
2.2	Periodic wash	6 to 10
2.3	Start-up procedure	-
2.4	Manual wash	-
2.5	Screen brightness adjustment	-
2.6	Previous page	-
2.7	Next page	-

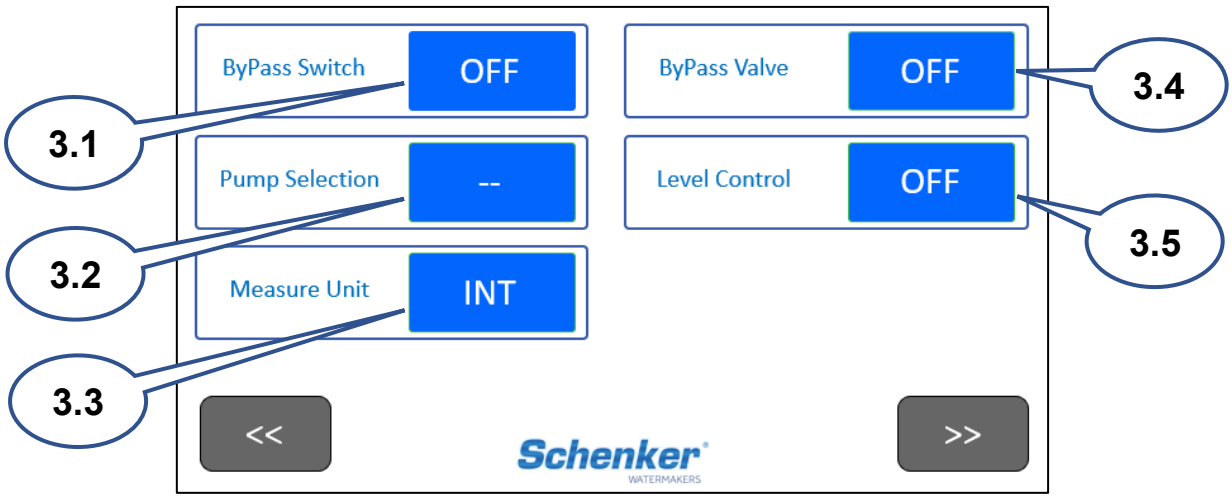
On the second page, the following functions can be performed:

- **PRODUCTION TIMER**: Pressing the *START* button starts the system for a predefined time ranging from 1 to 6 hours. The number of hours can be selected by pressing '*1HRS>*'. After the selected time interval has expired, the system will automatically perform a 90-second wash and then switch off. During operation, the countdown will appear on the main screen in the timer box.
- **PERIODIC WASH**: By pressing the *START* button, the system performs a periodic 90-second wash every 6 to 10 days. The time interval can be selected by pressing '*6 Days>*'. The fresh water consumed during each flush will be approximately 12 litres. During operation, the *FLUSH* button will light up on the main screen. and the countdown will appear in the timer box. The system must always be powered on, otherwise the function will be automatically deactivated.
- **AUTOMATIC STARTUP**: This function is used to automatically activate the first start-up procedure to be performed when the system has been installed or after performing the storage procedure (see *Paragraph 6.6*). The depressurisation valve must be open before starting the function.
- **MANUAL WASH**: Pressing the *START* button will cause the system to wash for an extended period of 5 minutes. This procedure can be interrupted at any time by pressing the *STOP* button. During operation, the *FLUSH* button will light up on the main screen. and the countdown will appear in the timer box.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

- **SCREEN BRIGHTNESS**: By moving the white dot to the right or left you can respectively increase or decrease the brightness of the screen. The adjustment is reset each time the system is no longer powered.

5.1.3 Page 3



PAGE 3
Fig. 5-3

No.	Function	Possible states
3.1	Deactivates the signal pressure switch	ON/OFF
3.2	Selects the pump type	N/D
3.3	Selects the type of measurement unit	INT/US
3.4	Deactivates the diverter valve (optional)	ON/OFF
3.5	Enables the level switches function	ON/OFF

On the third page, the following functions can be performed:

- **BYPASS SWITCH:** This function deactivates the signal pressure switch located on the watermaker (see detail 5.9 of *Fig. 3-10*) which ensures the correct shutdown of the machine. This function is only to be used in the event of a malfunction of the signal pressure switch and during the storage procedure. The function is deactivated as soon as the STOP button is pressed.
- **PUMP SELECTION:** This function allows you to select the operating pump. It is not enabled for this type of system because there is only one feed pump.
- **BYPASS VALVE:** This function allows you to deactivate the salinity probe control (OPTIONAL) which monitors the water purity value. By doing this, the fresh water produced will be fed directly into the tank regardless of its quality. The function is deactivated as soon as the STOP button is pressed.
- **LEVEL CONTROL:**. This function prepares the system for operation controlled by one or two level switches installed in the fresh water tank. Level switches are not included in the system.
- **MEASURE UNIT:** This function allows you to change the units of measurement from the international system (*INT*) to the imperial one (*US*).

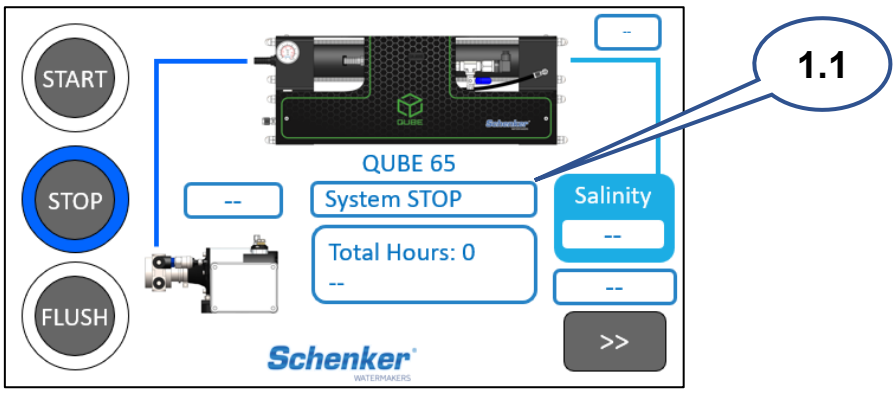
5.2 Description of warnings and alarms

Various warning or error messages can be displayed on the control panel display.

5.2.1 Warnings

The system has several warning states related to operation.

- **SYSTEM STATUS**

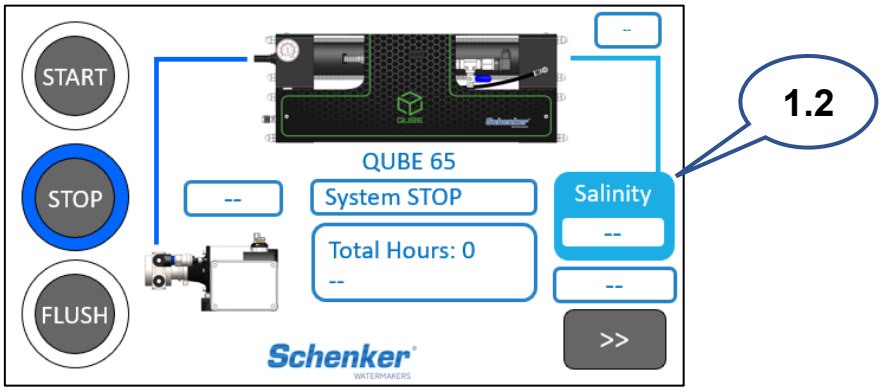


SYSTEM STATUS
Fig. 5-4

Box 1.1 displays the following states:

- **SYSTEM RUNNING:** The system is correctly in operation;
- **SYSTEM STOP:** The system is stopped and ready to be started;
- **SYSTEM STARTUP:** The system is performing the STARTUP procedure;
- **SYSTEM FLUSHING:** The system is performing the flushing procedure;
- **TANK FULL / AUTO:** If there are level switches in the fresh water tank on the boat, the system is paused because the tank has been filled and will restart as soon as it has been emptied.

- **SALINITY CONTROL (Optional)**



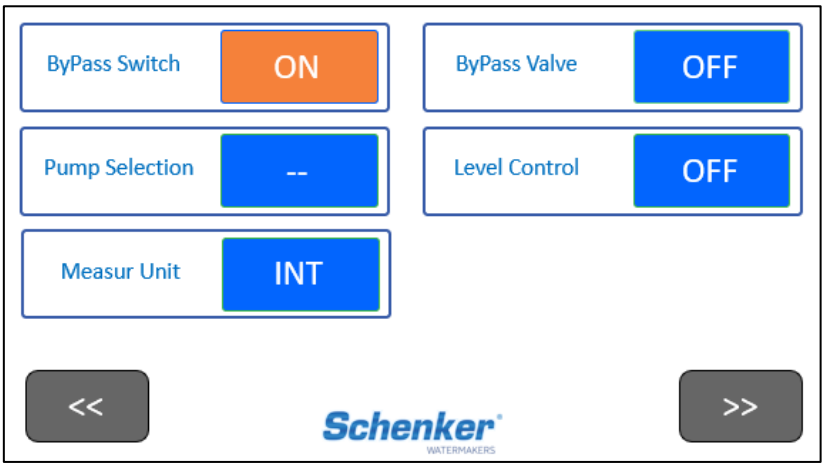
SALINITY CONTROL
Fig. 5-5

Box *1.2* can display the following states:

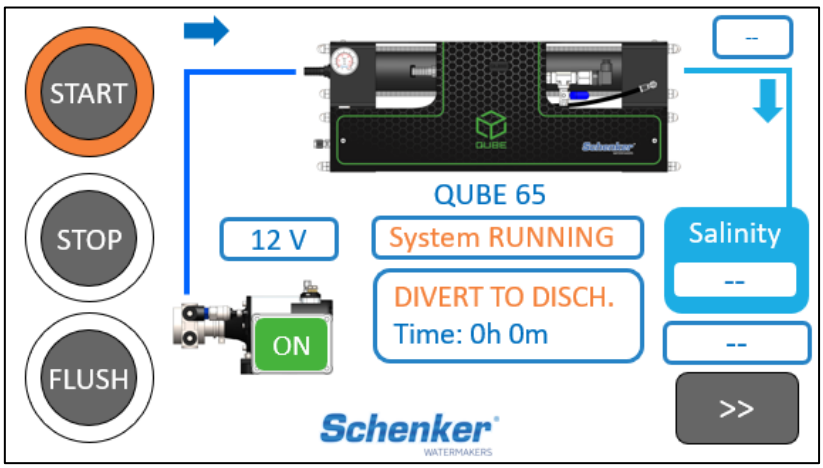
- **S = WAIT**: The probe is completing the measurement. This message appears every time the system is started up and lasts 1 minute. During this time the system discharges the fresh water production;
- **S = OK**: The quality of the water produced by the system is optimal and is sent to the tank;
- **S = MED**: The quality of the water produced by the system is medium and is sent to the tank;
- **S = BAD**: The quality of the water produced by the system is bad and is discharged so as not to contaminate the tank. This message may appear in the event of a salinity probe malfunction.
- **S = OK**: The probe is not connected.

- **BYPASS SWITCH**

By activating the ByPass Switch function introduced in *Subparagraph 5.1.3,* the following warnings appear indicating that the signal pressure switch has been deactivated:



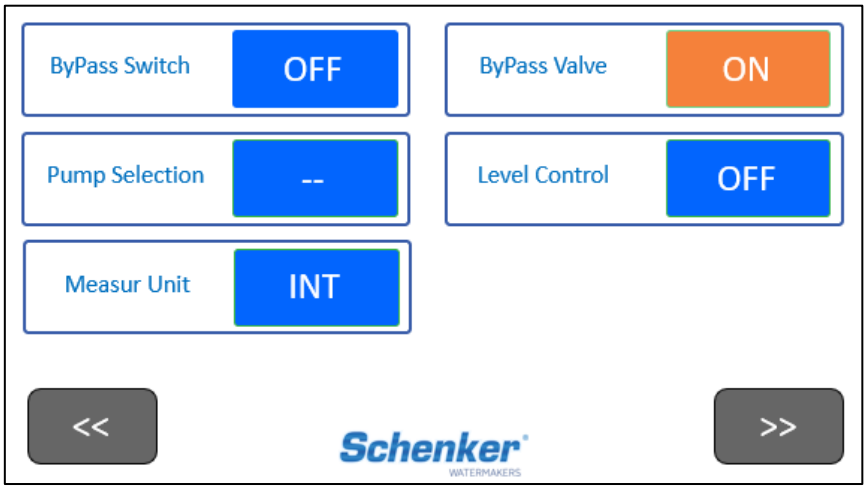
BYPASS SWITCH ON - PAGE 3
Fig. 5-6



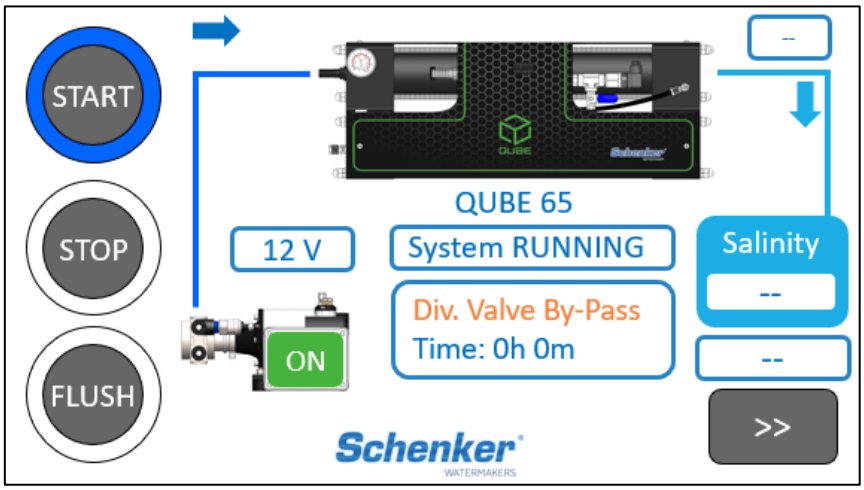
BYPASS SWITCH ON - PAGE 1
Fig. 5-7

- **BYPASS VALVE**

By activating the ByPass Valve function introduced in *Subparagraph 5.1.3,* the following warnings appear indicating that the salinity probe (optional) has been deactivated:



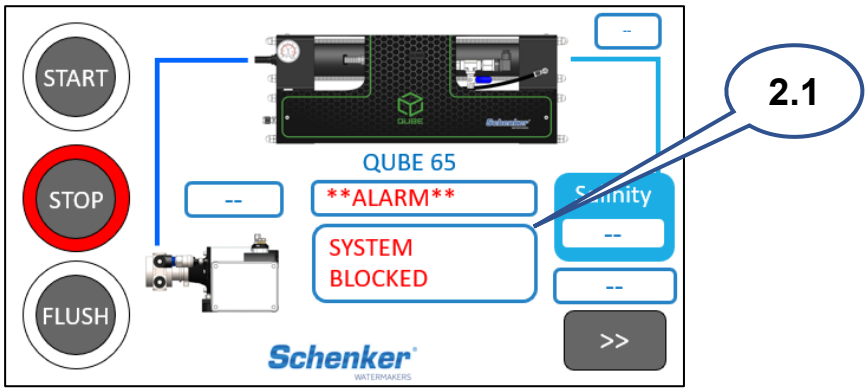
BYPASS VALVE ON - PAGE 3
Fig. 5-8



BYPASS VALVE ON - PAGE 1
Fig. 5-9

5.2.2 Alarms

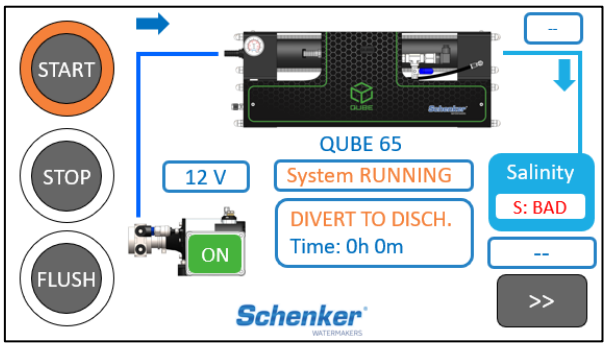
The system has several alarm states that immediately stop operation:



ALARM STATUS
Fig. 5-10

The alarms indicated in box 2.1 may be as follows:

- **SYSTEM BLOCK:** During operation, the system stops cycling and is blocked immediately.
- **CONTROL CABLE**: There is a discontinuity with the connection between the remote panel and the computer box.
- **LOW PRESSURE**: during operation of the system, the pressure drops below the minimum threshold value (2.5 bar). The system goes into alarm after 3 seconds and the system blocks.
- **PUMP NOT PRIMING**: the pressure does not reach the minimum threshold value (2.5) at start-up. The system goes into alarm after 8 seconds and the system locks.
- **HIGH PRESSURE**: during system operation the pressure rises above the maximum threshold value (11 bar). The system immediately goes into alarm and the system locks.
- **LOW VOLTAGE**: the supply voltage is not sufficient.The system immediately goes into alarm and the system locks up or does not start.
- **CHECK PRESS. SENSOR**: the pressure transducer is not connected or is connected incorrectly. The system does not start up.
- **BAD WATER QUALITY:** If the salinity probe (optional) measures an unacceptable value for at least 3 minutes, the diverter valve is activated and discharges production. The following warnings will appear on the screen:



NOTE
For troubleshooting refer to Paragraph 7.

5.3 Initial start-up procedure

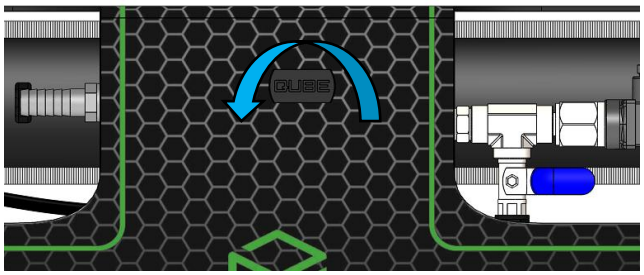
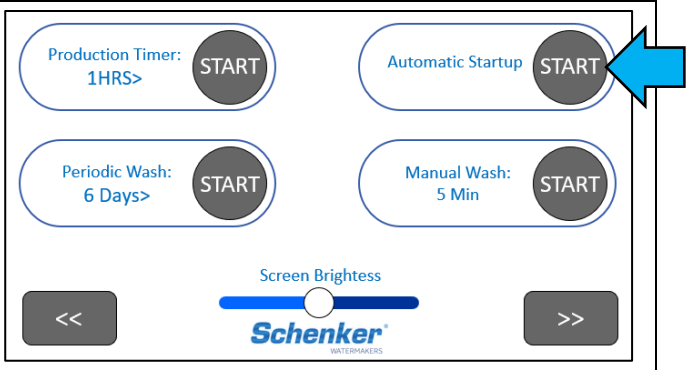
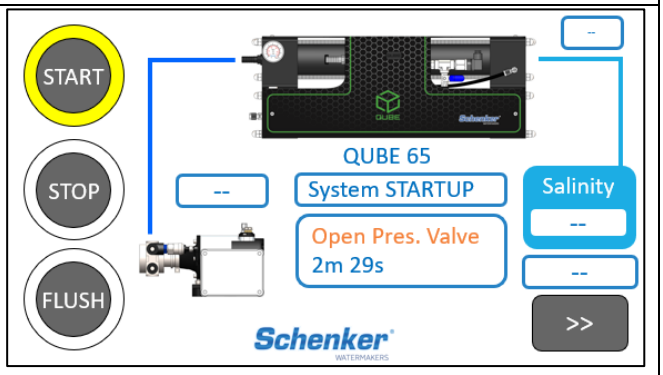
The initial start-up procedure is necessary when turning on a system for the first time or after carrying out storage and maintenance operations (filter change).
The purpose of this procedure is to purge the system of the air inside it.

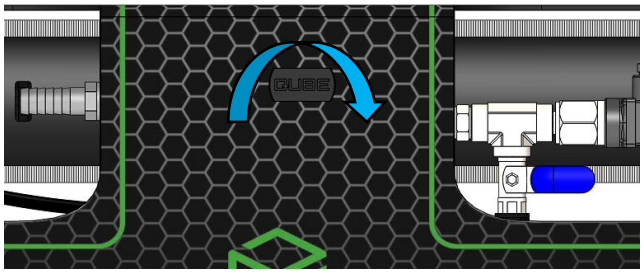
5.3.1 Checks prior to initial start-up procedure

Make sure you have carried out the following checks before proceeding with the initial start-up operation:

1. Check that all system components are correctly connected;
2. Check that the 5micron and activated carbon filter cartridges are installed;
3. Check that the sea water inlet shut-off valve and the drain valve, if any, are open;
4. Check that the reset valve is closed (lever orthogonal to the duct) and the positioner completely unscrewed;
5. Check that the autoclave is switched on;
6. Check that the fresh water valve on the activated carbon filter (grey valve) is open (the lever must be parallel to the water flow).
7. Check that the fresh water tank is sufficiently full (approx. 15 litres).

5.3.2 First start-up

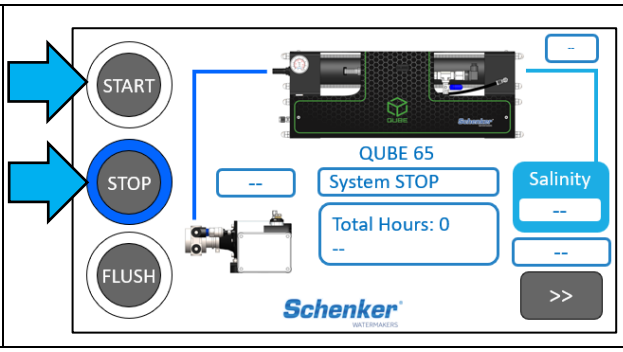
1. Open the depressurisation valve (unscrew the knob about one complete turn).	
2. Start the system using the *Automatic Startup* function. The procedure lasts 3 minutes.	
3. The *START* button will turn yellow and the message "*Open Pres. Valve*" appears indicating to keep the depressurisation valve open. During the first 15 seconds the system will draw in fresh water, after which it will draw in salt water for 1 minute 45 seconds.	

4. Close the depressurisation valve when the message '*Close Pres. Valve"* appears on the display. The message appears during the last 60 seconds of the STARTUP procedure. During this time the system will draw in fresh water.	

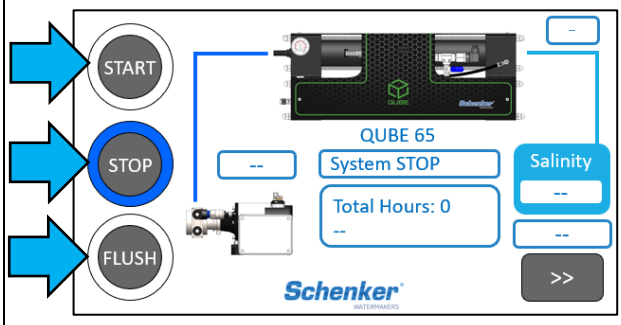
5.4 Normal operating procedure

Make sure you have carried out all the controls in *Subparagraph 5.3.1* before proceeding with normal operation.

5.4.1 Normal operating procedure without final flushing

1. Press *START* to start the system. 2. Press *STOP* to stop the system.	

5.4.2 Normal operating procedure with final flushing (recommended)

1. Press *START* to start the system. 2. Press *FLUSH* to book the flushing function. 3. Press *STOP* to stop the system. The *FLUSH* button will start flashing and the flushing function will start automatically for a minute and a half. About 12 litres of fresh water is used.	

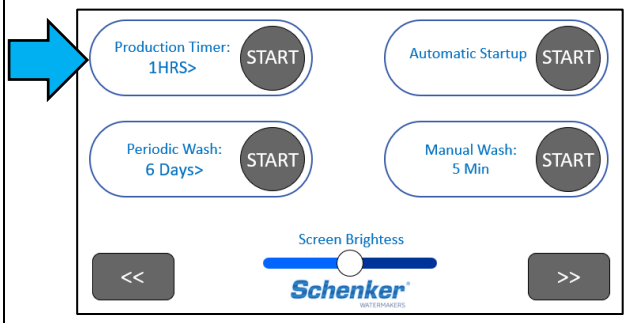
THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

5.4.3 Timer-operated work cycle

1. Access the second page of the display, set the timer by pressing *1HRS>* and press *START*. The work cycle with timer can be set from 1 to 6 hours.

2. Start the function by pressing the START button. During operation, a countdown will appear on the display. The system will automatically stop after the selected time and perform a flush.

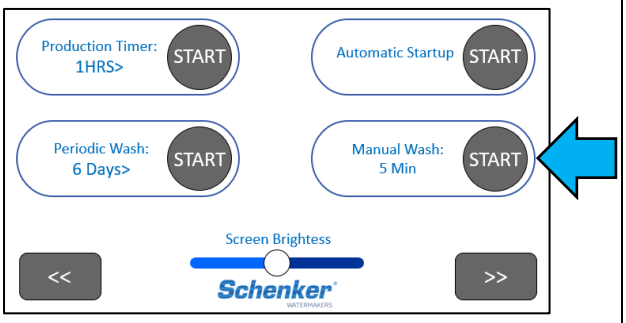
3. The unit can be stopped at any time by pressing the *STOP* button (without final flush) or by pressing the *FLUSH* and *STOP* buttons in sequence (with final flush).



5.4.4 Manual wash procedure

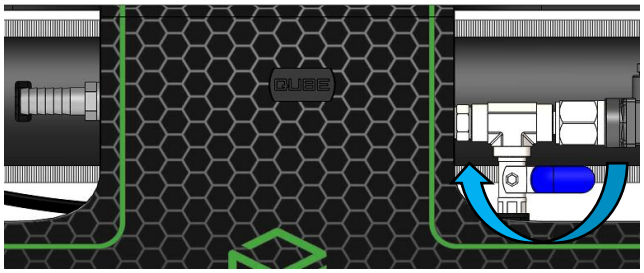
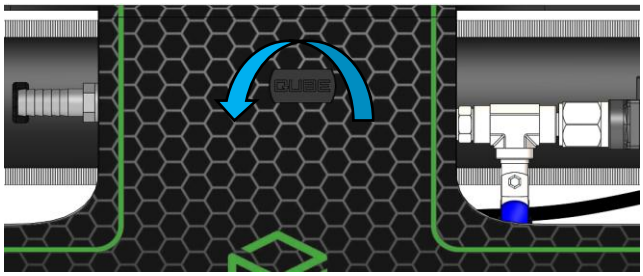
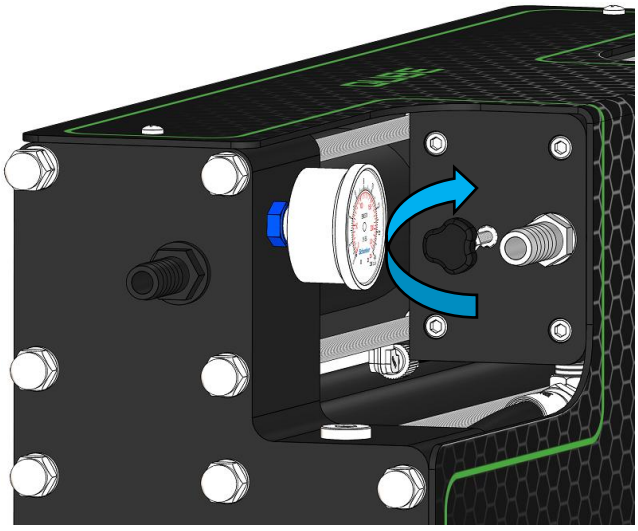
1. Access the second page and start the system by pressing the *START* button of the *Manual Wash* function. The 5-minute washing procedure begins. The FLUSH button on the first page will start flashing.

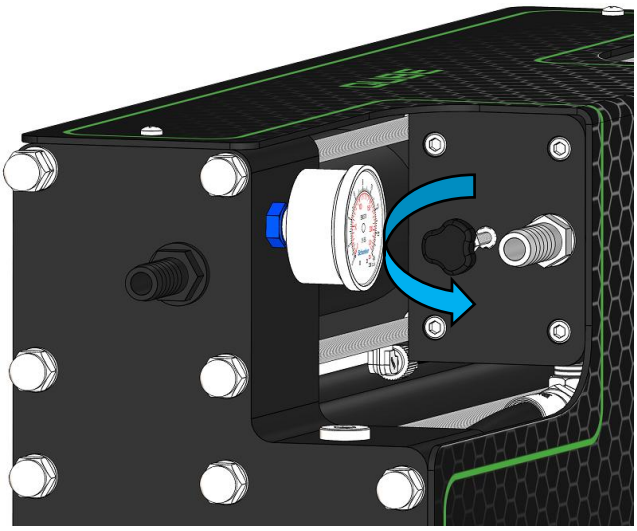
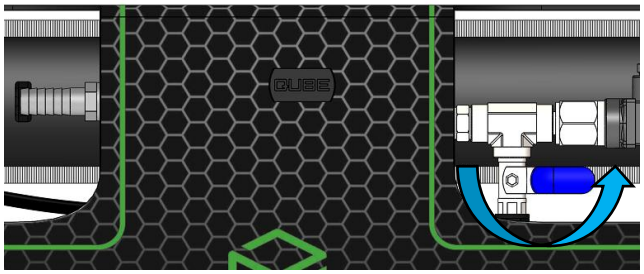
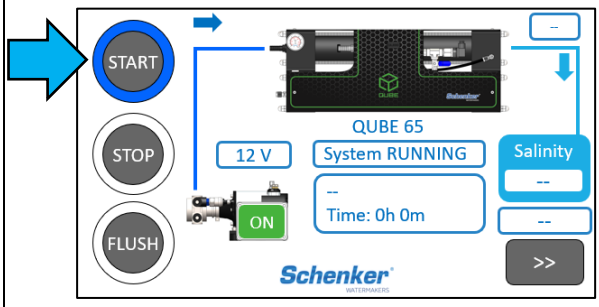
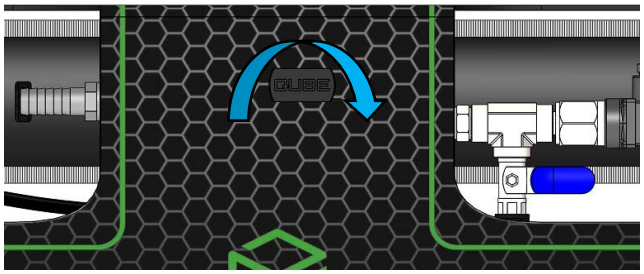
2. The unit can be stopped at any time by pressing the *STOP* button.



5.5 Reset procedure

The reset procedure **is necessary** when, at start-up, the pressure rises to the maximum threshold value of 11 bar, causing the system to go into high pressure block. This phenomenon can occur if the spindle inside the upper centre valve becomes stuck in the middle position during a shutdown. This position causes the internal ducts to remain closed, causing a sudden increase in pressure when the system is turned on. In all other cases of anomaly, the reset procedure **must not be performed**.
This phenomenon, although rare and unusual, does not damage the system, but it is necessary to restart the valve with the following procedure:

1. Open the reset valve (lever parallel to the duct).	
2. Open the depressurisation valve (unscrew the knob about one complete turn).	
3. Screw in the positioner, turning it clockwise, until the mechanical stop position is reached. 18 complete turns are required.	

4. Unscrew the positioner and return it to its original position, up to the rear mechanical stop.	
5. Close the reset valve (lever orthogonal to the duct).	
6. Restart the system by pressing the *START* key.	
7. After a few seconds, close the depressurisation valve.	

6. MAINTENANCE (ROUTINE AND EXTRAORDINARY)

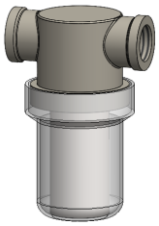
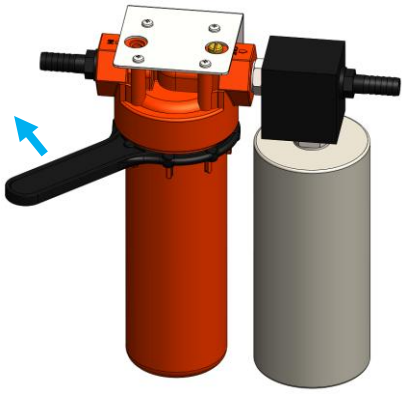
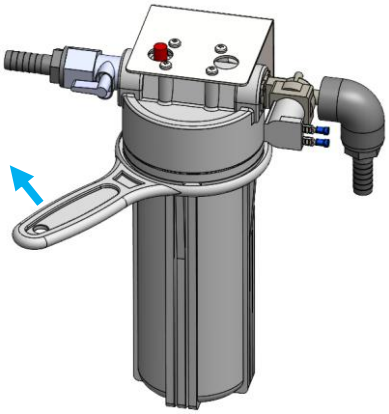
6.1 Filter cleaning check

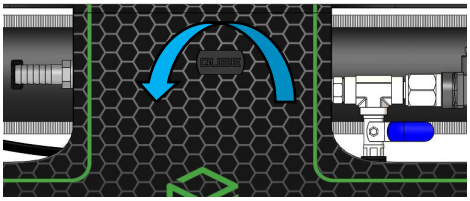
Periodically inspecting the cleanliness of the filter is very important.

The following filters are present in the system:

1. Mesh filter.
2. Pump filter (5 micron cartridge).
3. Activated carbon filter.

For proper filter maintenance, follow the table below:

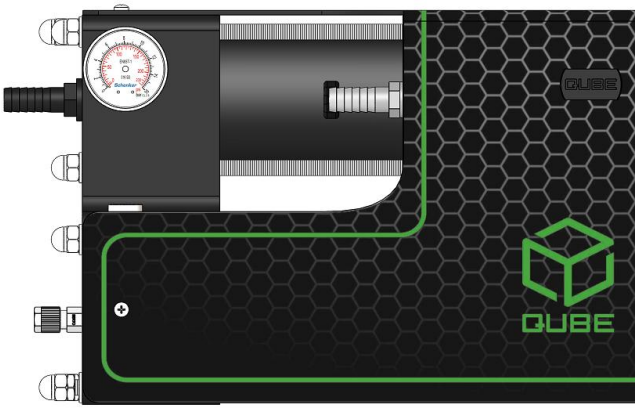
OPERATIONS	FREQUENCY	PROCEDURE
Checking and cleaning mesh filter.	Every five days.	**Visually check and rinse.** 
Replacement of 5 micron filter cartridge.	It depends on the working conditions and the turbidity of the seawater. Cartridges should usually be replaced every 60/70 hours of operation. Once the filters have been replaced, the system must be purged of air by opening the depressurisation valve for 2-3 minutes.	**Unscrew the lower base of the filter using the appropriate key provided.** 
Replacement of activated charcoal filter cartridge.	Every 6 months	**Unscrew the lower base of the filter using the appropriate key provided.** 

Purge the system periodically while on the boat. To purge, simply open the depressurisation valve slightly for 2-3 minutes with the system switched on.	At least every 15 days even if you do not use the system.	

6.2 Accumulator check

The pressure accumulator is a pressurised air tank and has the function of damping pressure oscillations during the watermaker system's cycling operations. It is pre-charged with a pressure of approximately 5 bar; However, the charge level must be checked periodically to ensure proper functioning of the watermaker. For the check, it is necessary to unscrew the valve cap on the underside of the accumulator and insert a tyre pressure gauge.	

6.3 System operating pressure check

To carry out this check, you need to read the pressure indicated by the pressure gauge located on the watermaker at the top left. The operating pressure depends on many factors such as: water temperature, salinity level of seawater, actual battery voltage, degree of cleanliness of the membranes, type of installation. The pressure, under average operating conditions, is approximately 7.8 – 8.2 bar. During cycling (when the piston inside the ERS changes direction) there is a small pressure jump of 0.2 bar.	

6.4 Checking for leaks

This check must be carried out often, since possible water leaks due to accidental causes (burst pipes, broken couplings, system failures) can be abundant and cause damage.

NOTE:
If you suspect a small leak on the system that is not visible, you can check it by placing a piece of cardboard or a sheet of absorbent paper under the suspected area. If the cardboard gets damp, there is likely a leak.

6.5 Checking and replacing membranes

Reverse osmosis membranes have an average life of 6/7 years. When the membranes are worn, the TDS (Total Dissolved Solids) values, commonly called fixed residue, exceed 800 ppm, making the water produced by the system appear salty. If flushing with chemicals does not produce results, it is recommended to change the membranes.

6.6 Storage procedure

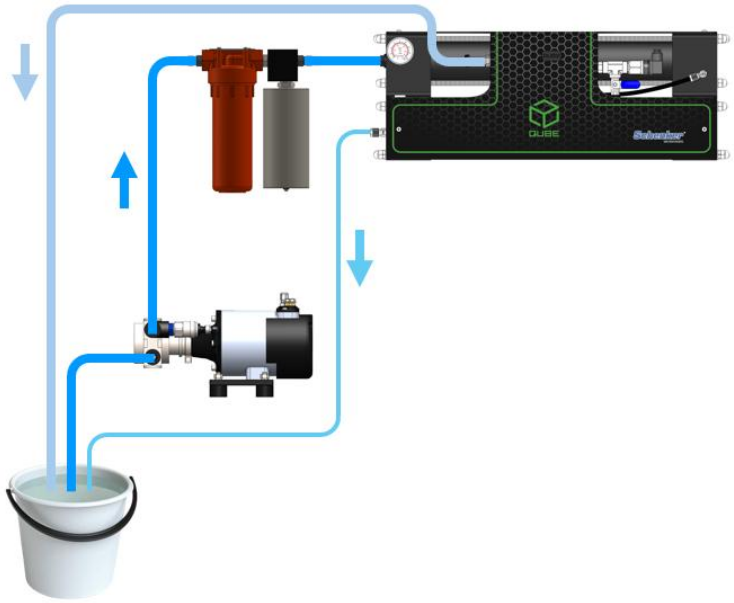
It is necessary to carry out the storage procedure before stops longer than 2 months, for example before wintering the boat. The purpose of storage is to clean the system of any limescale deposits and inhibit the growth of microorganisms that could reduce the efficiency of the reverse osmosis membranes. Before carrying out this procedure, check the condition of the 5 micron filter. If it is dirty, it must be replaced before starting the procedure.

6.6.1 Necessary equipment

The following equipment is required to carry out the storage procedure:

1. Bucket with at least 15 litres of non-chlorinated fresh water (water produced by the system itself is fine).
2. The following pipes connected to the bucket:
    a. Pump inlet;
    b. Watermaker discharge;
    c. Production of the watermaker.
3. One bottle of preparation SC1 (Schenker Cleaning 1). The solution must be prepared according to the package directions and using non-chlorinated fresh water.

    PLEASE NOTE: wear an FP2 respiratory protection mask to avoid inhaling product dust and EN166 bodywork protective goggles.
4. Equipment for dismantling the pipe system (screwdrivers, pliers, etc.).



HYDRAULIC DIAGRAM FOR STORAGE PROCEDURE
Fig. 6-1

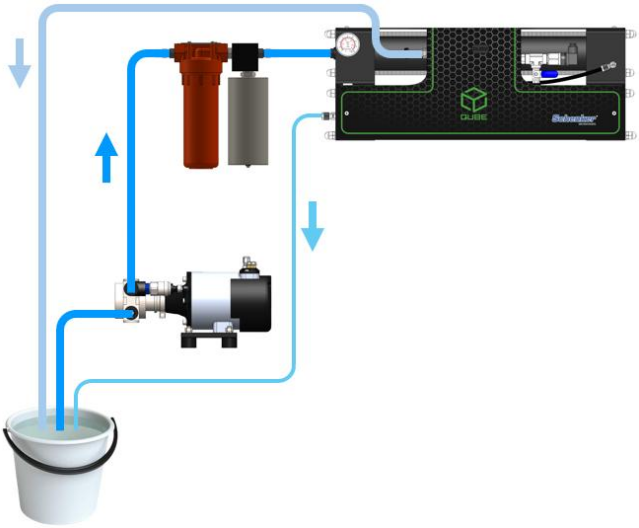
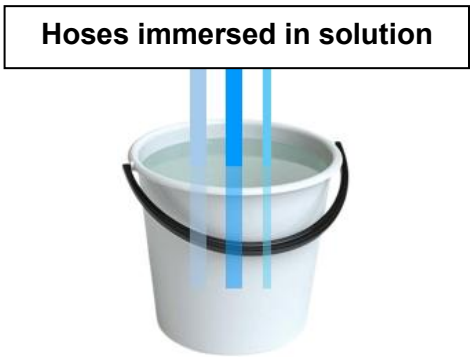
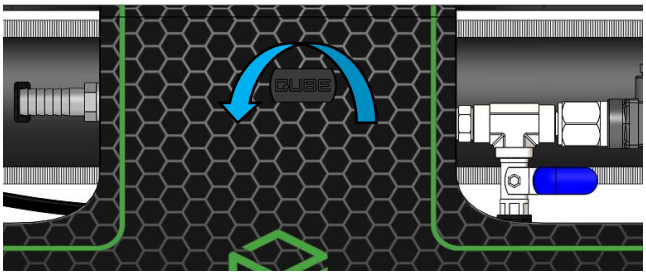
CAUTION
DO NOT USE SODIUM METABISOLPHITE IN THE SYSTEM This substance corrodes the plastic components of the watermaker, damaging it irreparably.

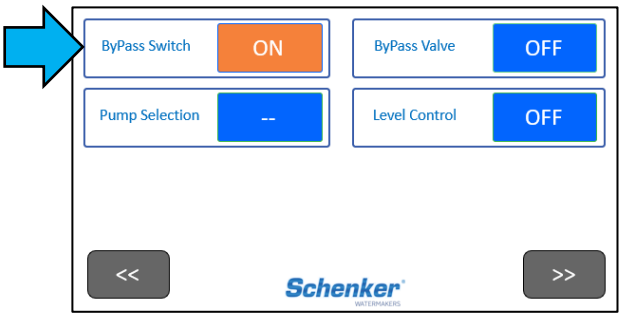
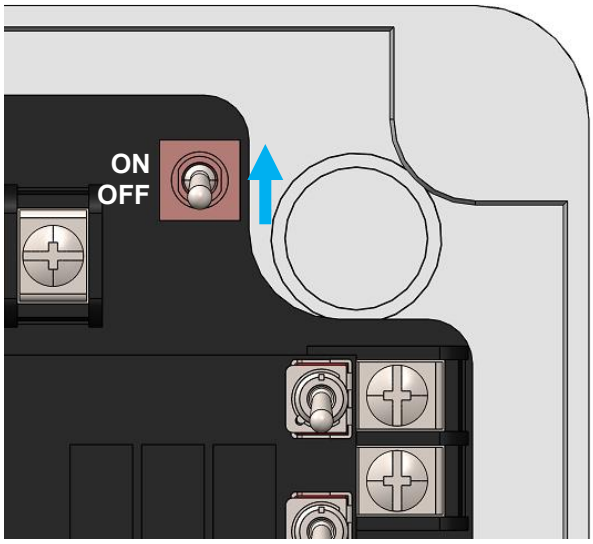
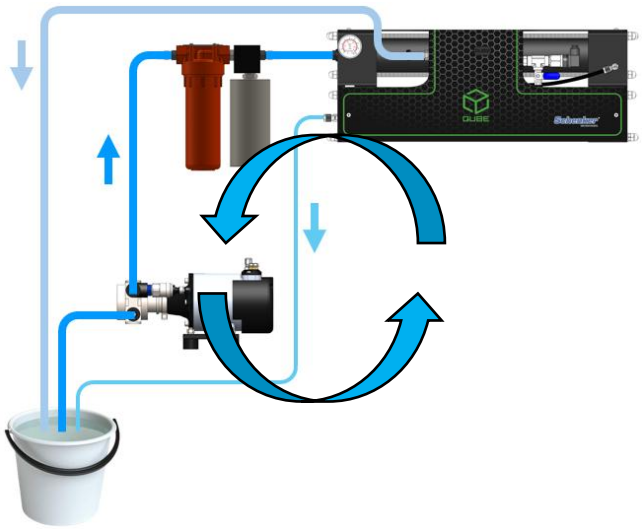
NOTE
The products available for the storage procedure are the following:
1) SCHENKER CLEANING 1 (SC1 - acid product) to remove inorganic residues and preserve the watermaker during wintering.
2) SCHENKER CLEANING 2 (SC2 – alkaline product) to remove organic components (mould and bacteria) when they have already settled; in this case the watermaker gives off a bad smell (like hard-boiled egg).

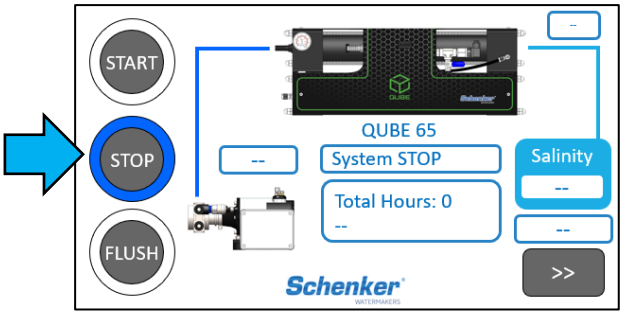
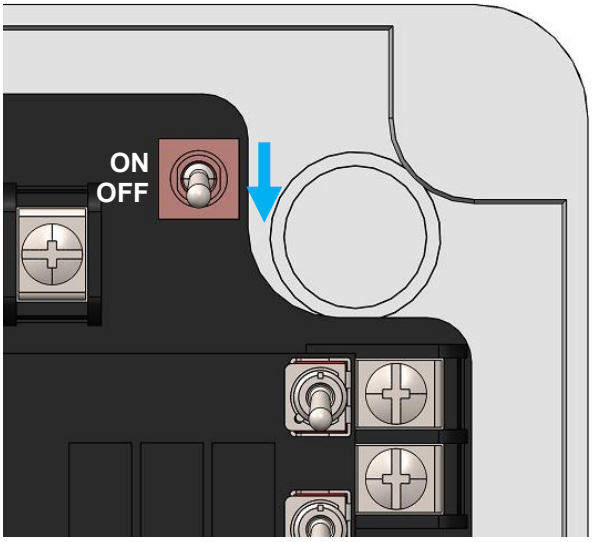
NOTE
Usually only SC1 is required, but if there is a bad smell, SC2 must also be used. In this case, you must, in sequence, use SC2, rinse the system with fresh water and, finally, use SC1; the latter must be left inside the system during the storage period.
After a storage procedure it is recommended to remove the filters and to replace them when restarting.

CAUTION
ONLY USE CHEMICALS SC1 and SC2 Do not use commercial products as they contain metabisulfite, a substance that corrodes the plastic components of the watermaker, damaging it irreparably..

6.6.2 Storage operation

1. Prepare the solution by carefully mixing the SC1 bottle with 15 litres of non-chlorinated fresh water.	
2. Connect the above hoses to the pump and to the watermaker and immerse them in the solution.	
3. Make sure that the hoses are completely immersed in the solution and cannot draw air.	
4. Open the depressurisation valve (unscrew the knob about one complete turn).	

5. Activate the *ByPass Switch* function on page 3 of the display and start the system by pressing the *START* button on the home page.	
5.1 Otherwise, the system can also be started up by moving the manual switch that controls the operation of the pump unit and is located inside the computer box to *ON* position.	
6. Leave the system running for approximately 20 minutes, always making sure that the hoses remain properly immersed in the solution.	

7. Switch off the system by pressing the STOP button and restore the hydraulic connections.	
7.1 Otherwise, the system can also be switched off by repositioning the manual switch that controls the operation of the pump unit and is located inside the computer box to *OFF* position. Restore the hydraulic connections.	

PRUDENCE
It is always necessary to perform a first start-up procedure when first using the system, in order to free the system of any air and chemicals remaining inside it.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

6.7 Antifreeze procedure (storage in cold climates – below 5°C)

It is recommended to carry out a normal storage operation beforehand using SC1 in order to clean the system and prevent both the proliferation of bacteria and the deposit of inorganic material.

After this operation, the system must be rinsed and filled with antifreeze liquid based on pure propylene glycol (LOOP - 37 PROPYLENE USP, IPC0014.25K).

The antifreeze to be used is a solution of **propylene glycol and non-chlorinated fresh water**.

The ideal concentration of propylene glycol is:

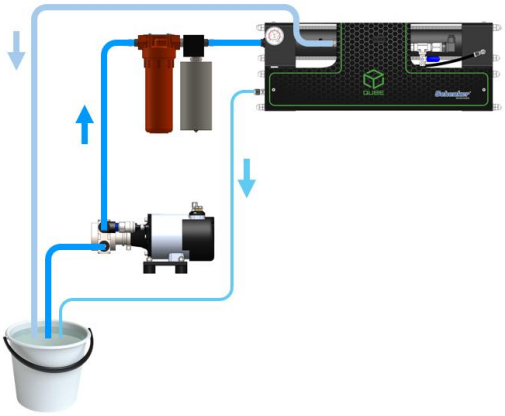
- 40% (for temperatures down to -20°)
- 50% (for temperatures up to -30°).

CAUTION
DO NOT USE OTHER PRODUCTS EVEN IF THEY HAVE SIMILAR NAMES SUCH AS ETHYLENE GLYCOL (TOXIC AND NON-BIODEGRADABLE PRODUCT).

The total volume of the solution must be 15 litres.

The procedure is similar to that used for flushing with SC1 and SC2:

1. Prepare the solution by carefully mixing the propylene glycol with 9 or 7.5 litres of non-chlorinated fresh water (respectively if you intend to store the system down to -20°C or -30°C) following the concentrations indicated above.
2. Make the hose connections indicated in the storage procedure.
3. Completely immerse the hoses in the bucket containing the solution, taking care that they do not draw in air.
4. Open the depressurisation valve.
5. Start the watermaker.
6. Leave the system running for approximately 20 minutes, always making sure that the hoses remain properly immersed in the solution so that they do not suck in air and do not pour the solution back into the boat.
7. Turn off the watermaker and restore the original hydraulic connections without emptying the system.



HYDRAULIC DIAGRAM FOR THE WINTERING PROCEDURE
Fig. 6-2

CAUTION
We recommend that you read the instructions in this manual in their entirety before proceeding with any type of operation.

7. TROUBLESHOOTING

7.1 Fault table

Fault alarms are detected by the pressure transducer and the electronic board.

- **The system pressure is below the minimum pump trigger value:**

PROBLEM: STALL		ERROR MESSAGE:. *PUMP NOT PRIMING*
#	TEST	ACTION
1	Check that the sea inlet is open and free of obstructions.	Open the sea inlet and clean it.
2	Check that the mesh filter is clean.	Clean the mesh filter. If cleaning is not sufficient, replace the filter.
3	Check that the hoses in the suction line are clear.	Install the hoses so as to avoid sharp bends.
4	Check that the pump has started.	Check that the supply voltage to the pump is as specified (12/24 V) and that the electrical cables are installed as shown in *Fig. 4-12*.
5	Presence of air in the system	Proceed with the purging of the system by performing the initial start-up procedure described in *Paragraph 5.2.2*.

- **The delivery pressure from the pump is less than the minimum threshold value:**

PROBLEM: LOW PRESSURE		ERROR MESSAGE:. *LOW PRESSURE*
#	TEST	ACTION
1	Check that the sea inlet and the mesh filter are clean and free	Check the sea inlet and clean the mesh filter.
3	Check that the watermaker is not operating in fresh water (river, lake, test water).	Ensure that the blockage disappears in normal operation with sea water.
4	Ensure that the depressurisation valve is tightly closed.	Close the depressurisation valve.
5	Presence of air in the system	Proceed with the purging of the system by performing the initial start-up procedure described in *Paragraph 5.2.2*.
6	Check the delivery flow rate of the pump. Contact an authorised service point.	Replace the pump if the flow rate is reduced.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

- **The pressure value detected by the transducer is higher than the upper threshold set in the electronic controller.**

PROBLEM: HIGH PRESSURE		ERROR MESSAGE:. *HIGH PRESSURE*
#	TEST	ACTION
1	Make sure that the 5 micron filter is not clogged.	Check the filter and replace it if necessary.
2	Supply voltage higher than 15% of the nominal value indicated in the Manual.	Install a converter so that the voltage is equal to the rated voltage. Use the watermaker with the generator switched off.
3	Check that the drain pipe is not kinked at the bends.	Install the pipe as straight as possible, avoiding bottlenecks.
4	When the system starts up, the pressure quickly reaches the high pressure threshold value.	Proceed with the watermaker reset as described in *Paragraph 5.4*.
5	The typical pressure peak of the watermaker's duty cycle is greater than 1.5 bar.	Check the pressure accumulator as stated in *Paragraph 6.2*. Valve shaft to be replaced.
6	If a valve has been installed on the drain pipe, check that it is not closed.	Open the valve. Install a non-return valve on the drain.

- **Low supply voltage:**

PROBLEM: LOW VOLTAGE		ERROR MESSAGE:. *LOW VOLTAGE*
#	TEST	ACTION
1	Check that the supply voltage is not less than 15% of the nominal value given in *Paragraph 3.4*.	Check that the voltage of the power batteries is greater than -15% of the nominal value of the system indicated in *Paragraph 3.4*.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED

- **Pressure transducer not detected by electrical controller.**

PROBLEM: TRANSDUCTOR NOT DETECTED		ERROR MESSAGE:. *CHECK PRESS. SENSOR*
#	TEST	ACTION
1	Ensure that the transducer connector is securely connected to the transducer body	Screw the cap onto the top of the transducer until it stops.
2	Check whether the transducer electric cables are connected to the wrong poles, in the circuit board	Connect the transducer cables as shown in *Fig. 4-12*.

- **The system does not cycle**

PROBLEM: *WATER FLOW INSUFFICIENT OR SIGNAL PRESSURE SWITCH FAILURE*		ERROR MESSAGE:. *SYSTEM BLOCK:*
#	TEST	ACTION
1	Check that the signal pressure switch is working	Start the system in By pass switch and ensure that the system cycles as specified
2	Check the delivery flow rate of the pump. Contact an authorised service point.	Replace the pump if the flow rate is reduced.

If the proposed tests were not conclusive, please contact either an authorised service point, or send an e-mail to Schenker Technical Support at ***service@schenker.it***. The request for support must include:

- The watermaker serial shown in *Paragraph 2.6;*
- Description of the problem with explanatory photos and videos;
- A description of any tests performed.

8. SUGGESTED SPARE PARTS

8.1 Short cruise (2/3 months' sailing)

For a short cruise it is recommended to have the CRUISING KIT - 207029, qty 1, on board, which contains the following components:

NAME	QUANTITY	CODE
CLEANING KIT (SC1+SC2)	1	207025 (207021+207022)
5 MICRON 10" FILTER CARTRIDGE	3	109002
10" ACTIVATED CARBON FILTER CARTRIDGE	1	109009

8.2 Long cruise (8/12 months of sailing)

For a long cruise it is recommended to have the following components on board:

NAME	QUANTITY	CODE
CRUISING KIT	3	207029
PUMP HEAD 60/80 L	1	103006
BRUSHLESS MOTOR 400W 12V*	1	203225
BRUSHLESS MOTOR 400W 24V*	1	203226
MEMBRANE 2521	2	109035
PORTABLE SALINITY TESTER	1	107044
PRESSURE TRANSDUCER:	1	107057
REPLACEMENT GASKETS KIT QUBE65	1	207052
PRESSURE SWITCH 2 BAR	1	107004

*The choice of motor depends on the type of power supply in the system.

THIS MANUAL BELONGS TO - **Schenker Italia** - ALL RIGHTS RESERVED