



Mab Watermaker AB

MAB Installation and Service Manual for Modular Systems

Installation and Service Manual

*Technical guide to modular systems
with FLUSH, BOX and HATCH*

Mounting • Water connections • Electrical installation and control
• Service





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1 How to use the documentation

Read the safety instructions before starting work. Plan the location of the components, mount the system, then follow the instructions for water connections, electrical installation and initial start-up.

Use the wiring diagram and component information supplied with the system. Check the model, voltage and document revision before making connections.

Illustrations and diagrams use English labels. Component references, terminal numbers and physical RUN/FLUSH markings match the supplied system.

Document	Purpose
This manual	Installation, initial start-up, technical operation and service.
User manual for modular control panels	Daily starting and stopping, flushing, preservation, frost protection and operating log.
Hose and wiring diagrams	Connections and component references for the supplied configuration.
Comet pump instructions	Oil, service intervals and work on the high-pressure pump.



2 About this manual and safety

Scope and intended users

This manual covers installation, initial start-up and service of MAB modular systems with FLUSH, BOX and HATCH. It is intended for installers, service personnel and owners. Check the supplied pumps, membranes, voltages and controls before starting work.

Before working on the system

WARNING Isolate the relevant power supplies and prevent automatic starting before installation or service. Remember that the timer or external controls may request a start even when the system is not being operated manually.

WARNING Release the pressure and check that the system is depressurised before disconnecting hoses or fittings or removing end caps.

Close the seawater inlet before disconnecting hoses or components on the intake side. Collect any escaping water and protect electrical components from spills.

Electrical work must be carried out by personnel with the appropriate competence for the installation. Follow the system wiring diagram and keep 230 V circuits separate from low-voltage circuits.

Protecting the system

Do not use feed water containing oil, chlorine or other substances that may damage the membrane.

The system is equipped with a pressure vessel and seawater RO membrane with a maximum allowable pressure of 1,000 psi, approximately 69 bar. The maximum allowable water temperature for the RO membrane is 45 °C.

These are the components' absolute limits, not normal operating settings. Follow the operating pressure and product water flow instructions for the supplied model. Other components may have lower limits.

- Increase the operating pressure slowly using the control valve. Never exceed the specified operating pressure or permitted product water flow.
- Never run the pumps without water. Ensure an unrestricted water supply and clean prefilters.
- Maximum water temperature: 45 °C. Excessively hot water can damage the RO membrane material and permanently reduce salt rejection. This temperature limit applies to both production and flushing.
- Use chlorine-free water. Chlorine attacks the membrane's salt-rejecting polyamide layer and can permanently increase salt passage. Tank water used for flushing must pass through the system's carbon filter. Follow the cartridge replacement instructions and do not use chlorinated cleaning agents in the membrane circuit.
- Protect the system from frost. Follow the user manual's instructions for preservation, draining and frost protection during extended shutdowns.



3 System overview

Main components

Component	Function
Control panel	Operate the system and display pressure, product water flow and TDS. A timer starts automatic fresh water flushing during shutdowns, replacing the water to reduce biological growth in hoses and membranes.
Separate control unit	Programmable pump-control relay and terminal block for electrical components. The control panel connects via a Deutsch connector.
Seawater strainer upstream of pump	Protects the seawater pump by removing coarse particles.
Seawater pump	Supplies feed water to the system through the prefilters.
Prefilters	Remove particles upstream of the high-pressure pump and membrane.
High-pressure pump and motor	Generate the pressure required for reverse osmosis.
Pressure vessel and RO membrane	Separate the water flow into product water and concentrate.
Needle valve and pressure relief valve	Regulate operating pressure and limit overpressure, respectively.
Flushing pump and carbon filter	Supply flushing water to the system as shown in the hose diagram.
Three-way valves and non-return valves	Direct product water, flushing water and preservation solution along the required flow paths.

Water flow and operation

Feed water passes through the seawater strainer, seawater pump and prefilters (20 μm , then 5 μm) to the high-pressure pump. Pressure rises before the RO membrane, which separates product water from concentrate. Concentrate leaves through the needle valve.

Product water is monitored and diverted to the sample outlet or tank. Flushing uses tank water through a separate carbon-filtered path. Non-return valves direct flow as shown in the hose diagram.

01 · Production

Seawater and high-pressure pumps are running.

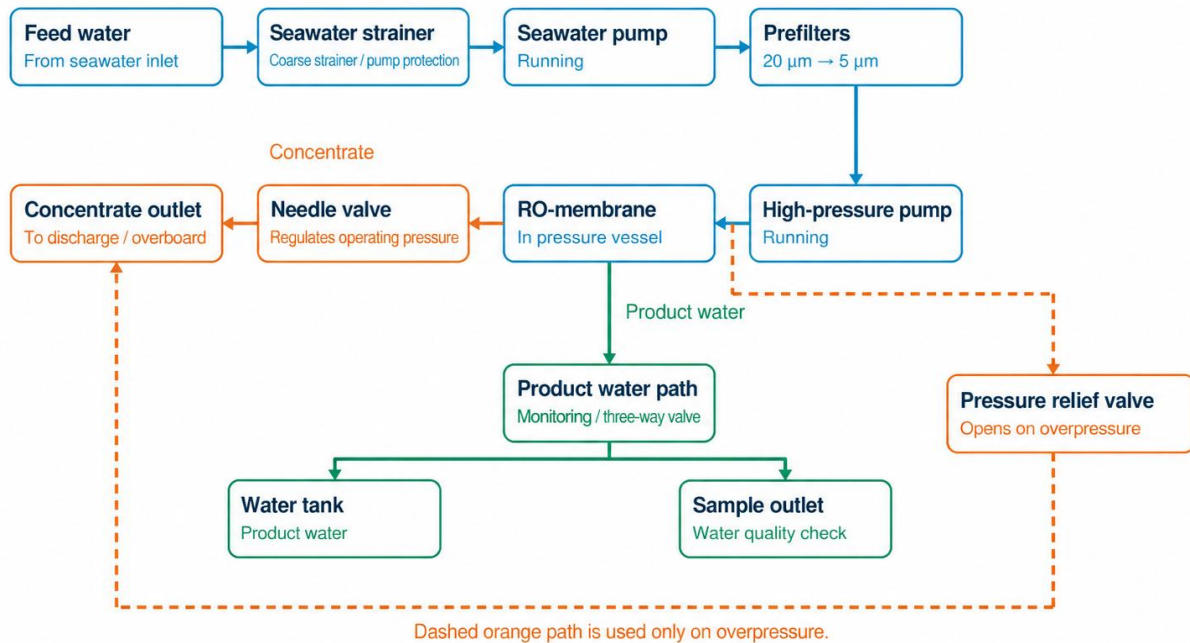
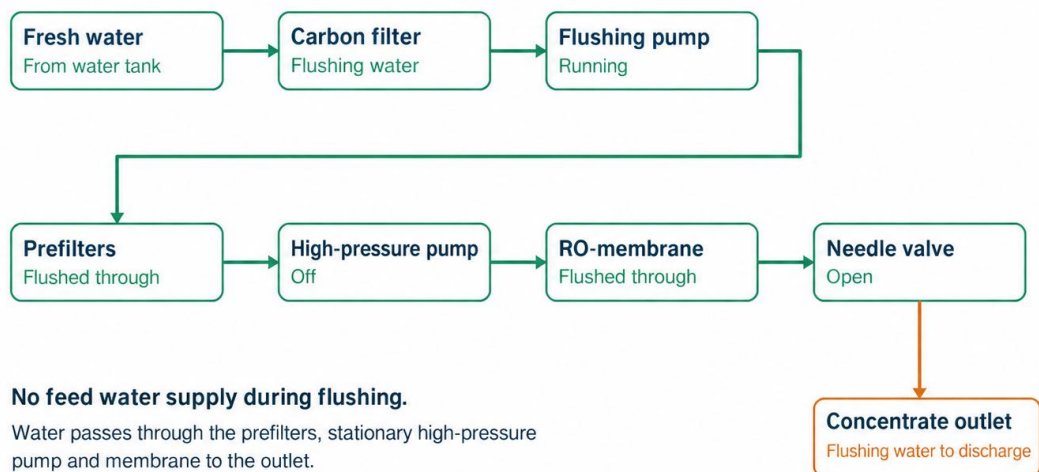


FIGURE 02 · Principle diagram. Hose connections and valve positions: see Appendix A.

Bypass, non-return valves, electrical connections and automation module valve paths are not shown.

02 · Manual fresh water flushing

The flushing pump runs. The seawater and high-pressure pumps are off.



No feed water supply during flushing.

Water passes through the prefilters, stationary high-pressure pump and membrane to the outlet.

The pressure relief branch is unchanged and is shown in the production diagram.

FIGURE 02 · Principle diagram. Hose connections and valve positions: see Appendix A.

Bypass, non-return valves, electrical connections and automation module valve paths are not shown.



4 System data for the supplied configuration

Technical data

This manual covers MAB modular systems with FLUSH, BOX and HATCH control panels. Systems are supplied with different pumps, supply voltages and membrane configurations.

Details of the supplied system are given in the accompanying system data sheet. It lists the main components, production capacity, electrical data and permitted operating values. The sheet distinguishes between normal operating pressure, maximum allowable system pressure and the pressure relief valve opening pressure.

The system data sheet relates to the system model and serial number and must be kept with this manual. If pumps, membranes or other equipment are changed, update the sheet to reflect the installed configuration.

For installation and operation, use the system data sheet together with the hose diagrams in Water connections and panel and the wiring diagram for the supplied configuration. Appendix A identifies the information in this manual and documents supplied separately.

Seawater strainer and pressure relief valve

Fit a seawater strainer on the inlet side of the seawater pump. A strainer is included in the pump kit, but the installer may select another suitable seawater strainer matched to the pump's flow and connections. It protects the pump and does not replace the prefilters downstream of it.

Pressure relief valve P24 limits the high pressure and may be factory-fitted directly to the high-pressure pump. Its location and setting must match the system data sheet. Connect its discharge as shown in the hose diagram. The setting procedure is described in Pressure relief valve.

Production and readings

Product water flow depends on feed water temperature and salinity, operating pressure, and membrane model and condition. Read the stated production capacity together with the reference conditions in the system data sheet.

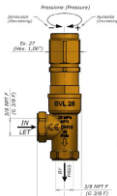
Record baseline readings in the installation record during initial start-up. Compare later readings under similar operating conditions and observe the specified pressure, temperature and product water flow limits.

5 Component list

Use the references below to identify parts in the manual and hose diagrams. Check quantities and model-specific parts against the delivery picking list.

Component and image	Description and connection	Qty
P01 	Non-return valve for 12 mm tubing Install in accordance with the flow arrow and hose diagram.	2
P05 	Tee fitting for 12 mm tubing Pressure sensing line to the low-pressure gauge. Connect between the prefilters and high-pressure pump as shown in the hose diagram.	1
P06 	Tee fitting for 12 mm tubing Fitting in the concentrate discharge line as shown in the hose diagram.	1
P07 	Water pump connectors Quick connectors for the low-pressure pumps.	2
P10 	Straight push-fit connector for filter housing 12 mm × G1/2 (BSPP) Connections to the filter heads. Check inlet and outlet ports.	4

Component and image	Description and connection	Qty
P11 	Three-way valve Selects sample outlet or tank, and tank water or external container, as shown in the hose diagram.	2
P12 	Push-fit elbow 12 mm × 12 mm Additional fittings Additional elbow for low-pressure tubing, if required.	4
P13 	Two-way branch connector Branch connection between flushing and feed water lines as shown in the hose diagram.	1
P15 	Elbow for 12 mm tubing Additional elbow for low-pressure tubing, if required.	4
P16 	Hose connector with 1/2-inch thread Hose connector with 1/2-inch thread as shown in the hose diagram.	1
P20 	Pressure vessel connection kit Including plug Fittings at the pressure vessel feed inlet. See Pressure vessel and RO membrane.	1 kit

Component and image	Description and connection	Qty
P21 	Pressure vessel connection kit Concentrate and product water outlets Install as described in Pressure vessel and RO membrane. The product water outlet can be fitted at either end; fit the centre plug at the opposite end.	1 kit
P22 	High-pressure pump connection kit Including feed water connection Connections to the high-pressure pump inlet and high-pressure outlet as shown in the hose diagram.	1 kit
P23 	Seawater pump bypass kit Install as described in Seawater pump bypass and the hose diagram.	1 kit
P24 	Pressure relief valve Model as specified in the system data sheet. Limits high pressure by diverting water to the discharge. See Pressure relief valve.	1 kit
P26 	Circuit breaker and main switch For direct current (DC) Connect as shown in the wiring diagram for the supplied configuration.	1
P31 	Seawater pump Feed booster pump Feeds seawater to the system as shown in the hose diagram.	1

Component and image	Description and connection	Qty
P32 	Seawater pump cooling fan Mounted at the seawater pump.	1
P33 	Fresh water flushing pump Supplies fresh water for flushing as shown in the hose diagram.	1
P36 	High-pressure hose 4 m From the high-pressure pump to the pressure vessel.	1
P37 	High-pressure hose 4 m From the pressure vessel to the control panel.	1
P40 	20 µm filter cartridge Fit in the first prefilter housing in the direction of flow.	1
P41 	5 µm filter cartridge Fit after the 20 µm filter, upstream of the high-pressure pump.	1

Component and image	Description and connection	Qty
P42 	Carbon filter cartridge Removes chlorine from tank water during flushing. Follow the cartridge replacement instructions.	1
P43 	Twin filter housing With transparent bowls Filter heads for the 20 µm and 5 µm cartridges. Check inlet and outlet ports.	1
P44 	Single carbon filter housing With transparent bowl Filter head for the carbon filter in the flushing line.	1
R38 	Coupling for twin pressure vessels Used only in twin-vessel configurations. Follow the hose diagram for that configuration.	See order
P45 	Tube cutter Use to make clean, square cuts in the low-pressure tubing.	1
P46 	Glycerol Apply to seals where specified by the pressure vessel instructions.	1

Component and image	Description and connection	Qty
<p>P47</p> 	<p>Preservative (pickling solution) 75 ml</p> <p>Follow the user manual and the instructions for the supplied preservative.</p>	1
<p>P48</p> 	<p>12 mm water tubing</p> <p>Low-pressure tubing for connections as shown in the hose diagram.</p>	15 m

6 Planning and mounting

Planning the installation

Lay out the components and plan hose and cable routes before securing them. Ensure that filter bowls can be unscrewed, the pump oil level can be checked and the membrane can be removed from the pressure vessel without extensive dismantling.

Position the seawater inlet so that it does not draw air when heeling or underway. Check the suitability of any shared inlet. Fit a shut-off valve and coarse strainer upstream of the seawater pump.

Battery cables from the boat's supply and connections to the seawater inlet and existing water tank must suit the installation. Check the contents of the delivery before starting work.

Control panel and separate control unit

Position the control panel where the gauges are easy to read and the needle valve can be adjusted during start-up and operation. Leave space behind the panel for hoses, fittings and the connecting cable.

Mount the control unit in a dry, protected and accessible location. Leave room to open the enclosure and work on the terminal block. Connect the panel using the specified Deutsch connector and provide cable strain relief.

Component locations and dimensions



Control panel



Separate control unit



Pressure vessel with RO membrane



Seawater pump



Prefilters

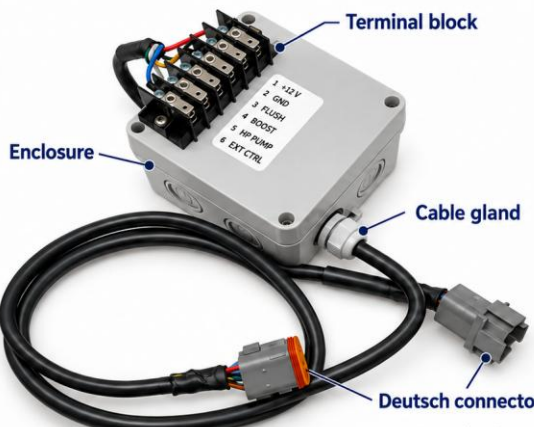
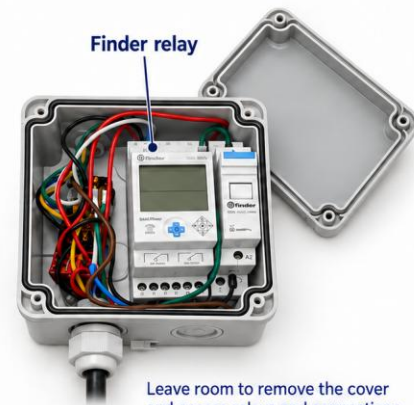


High-pressure pump



**Flushing pump
with carbon filter**

Panel	Dimensions and mounting
FLUSH	<p>Panel size: width 26 × height 25 cm. Cut-out: 23 × 23 cm. Required installation depth behind the panel: 12 cm.</p>
	
BOX	<p>Surface-mounted on a wall or bulkhead. Dimensions: width 26 × height 25 × depth 12 cm. Hose and cable exits at the bottom.</p>
	

Panel	Dimensions and mounting		
HATCH	<p>HATCH is recessed into a wall or bulkhead.</p> <p>The door has a recessed handle and a 175° opening angle.</p> <p>Overall size: width 37.5 × height 40 cm.</p> <p>Cut-out: width 30 × height 33 cm.</p> <p>Required installation depth behind the panel: 15 cm.</p>		
Control unit			
	<h3 style="text-align: center;">Control unit and external connections</h3> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>External view</p>  </div> <div style="text-align: center;"> <p>Internal view</p>  <p>Leave room to remove the cover and access relays and connections.</p> </div> </div> <div style="margin-top: 10px;"> <p>Terminal markings</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>1 +12 V – Supply</p> <p>2 GND – Return (negative)</p> <p>3 FLUSH – Flushing pump</p> </td> <td style="width: 50%; vertical-align: top;"> <p>4 BOOST – Seawater pump</p> <p>5 HP PUMP – High-pressure pump control</p> <p>6 EXT CTRL – External control</p> </td> </tr> </table> </div>	<p>1 +12 V – Supply</p> <p>2 GND – Return (negative)</p> <p>3 FLUSH – Flushing pump</p>	<p>4 BOOST – Seawater pump</p> <p>5 HP PUMP – High-pressure pump control</p> <p>6 EXT CTRL – External control</p>
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7 Installing pumps and filters

High-pressure pump and motor

Mount the high-pressure pump level on a stable base in a dry, ventilated location. Leave room for oil inspection and service. Route hoses so that vibration is not transmitted to bulkheads or other fittings.

If the pump and motor are supplied separately, follow Comet's assembly instructions and apply the specified lubricant to the motor shaft. Check alignment before assembly.

Replace the transport plug with the specified dipstick or breather plug and check the oil level before starting. Oil grade, quantity and intervals are given in High-pressure pump oil and maintenance.

Motors become hot during operation. Provide free airflow and keep hoses and cables away from hot surfaces.

Component and image	Mounting and connection
Pump and motor 	Follow Comet's assembly instructions. Apply the specified lithium grease to the motor shaft before assembly. Check fit and mounting. Replace the transport plug and check the oil level before starting.
High-pressure pump with 12 or 24 V DC motor 	Mount level in a dry, ventilated location. Check voltage and pump model against the system data sheet. Use the specified oil grade and quantity.
High-pressure pump with 230 V AC motor 	Mount level in a dry, ventilated location. Follow the pump instructions for oil and service. Electrical connections are described in Electrical installation and control.

Seawater pump and flushing pump

Mount the seawater and flushing pumps protected from water, with accessible connections. Follow the mounting instructions for the supplied pump model. Check permitted mounting orientation and maximum suction lift before choosing the location.

If the seawater pump is supplied with a cooling fan, install it as instructed. Wire the fan to run whenever the seawater pump runs. Refer to the wiring diagram for polarity and connection point.

Component and image	Mounting and connection
<p>Seawater pump</p> 	<p>Fit the supplied inlet strainer upstream of the pump. If the location requires it, use another suitable seawater strainer matched to the pump's flow and connections. Mount the pump level or, when wall-mounted, with the pump head facing down to help release air. Check permitted mounting orientation and maximum suction lift in the pump instructions.</p>
<p>Seawater pump cooling fan</p> 	<p>Install as instructed for the supplied kit. Wire the fan as shown in the wiring diagram so that it starts with the seawater pump.</p>
<p>Flushing pump</p> 	<p>Install as instructed for the pump model. Connect tank water through the carbon filter as shown in the hose diagram.</p>



Prefilters and carbon filter

Position the twin filter housing so that the filters can be inspected and the bowls removed. Leave room below the bowls for cartridge replacement and collection of spills. Feed water must pass through the 20 μ m filter first, then the 5 μ m filter. Follow the flow markings on the filter head and the hose diagram.

Install the carbon filter in the flushing water flow path as shown in the hose diagram. Allow access for cartridge replacement. Follow the supplied cartridge's replacement instructions; chlorine removal capacity cannot be assessed by visual inspection alone.

Component and image	Mounting and connection
<p>20 μm and 5 μm prefilters</p> 	<p>Flow sequence: 20 μm before 5 μm. Leave room to unscrew the bowls and remove the cartridges.</p>
<p>Carbon filter for flushing</p> 	<p>The carbon filter protects the RO membrane from chlorine in the tank water.</p> <p>Replace it at least before each season.</p> <p>Never use chlorinated water or chlorinated cleaning agents in the watermaker's membrane circuit.</p>

8 Pressure vessel and RO membrane

This chapter describes positioning the pressure vessel and installing the RO membrane, end caps and connections. Also follow the component instructions for the supplied pressure vessel and membrane.

Positioning and mounting

Mount the pressure vessel using the specified brackets. Check whether the brackets are inside the vessel on delivery and remove them before installation. Leave enough room to release the end caps and remove the membrane for service.

Follow the pressure vessel instructions for permitted mounting orientation. For vertical or diagonal mounting, position the feed inlet at the bottom if this agrees with the component instructions and hose diagram.

The maximum allowable water temperature for the RO membrane is 45 °C. Position the system so that heat, for example from the engine compartment, cannot cause any component's temperature limit to be exceeded. See Protecting the system and the system data sheet.

Component and image	Mounting and connection
Pressure vessel 	Use the specified brackets and allow service access at both ends. Follow the flow direction shown in the hose diagram.

Preparation and membrane orientation

The membrane's black V-shaped brine seal must be at the feed inlet, on the side connected to the hose from the high-pressure pump. When inserting the membrane from this side, insert the end with the brine seal last. Check seal orientation against the membrane instructions.





Lubricate the membrane O-rings and brine seal with the supplied glycerol (glycerine). For the pressure vessel end cap seals, follow the vessel's assembly instructions.

Installing the membrane and end caps

The procedure below shows installation from the feed inlet side. The images show component positions. Also follow the supplied pressure vessel's instructions.

Step	Action
<p>1</p> 	<p>Remove the end caps as instructed for the pressure vessel. Remove any brackets and loose parts from inside. Check that the vessel and seal contact surfaces are clean and undamaged.</p>
<p>2</p> 	<p>Fit the end cap O-rings in their grooves. Check that the seals are seated evenly and are not twisted or damaged.</p>
<p>3</p> 	<p>Lubricate the end cap seals with the lubricant specified for the pressure vessel. Use the supplied P46 glycerol where specified.</p>

Step	Action
<p>4</p> 	<p>Identify the thread type of each fitting. Seal tapered threads as instructed by the fitting manufacturer.</p> <p>Use the specified sealing washer on connections that seal against a mating face.</p> <p>On the high-pressure adapter, thread tape may also be applied to the lower part of the thread, keeping it clear of the sealing face. This is optional but may improve sealing.</p>
<p>5</p> 	<p>Fit the external threaded high-pressure adapters to both end caps before inserting the caps into the vessel. This makes tightening easier. Follow the fitting assembly instructions.</p>

Step	Action
<p>6</p> 	<p>Fit the concentrate-side end cap first. Insert it squarely to avoid damaging the seal. If it binds, check seal position and lubrication before continuing.</p>
<p>7</p> 	<p>Move the end cap to the position where the retaining segments can be fitted in their grooves. Use only the assembly method specified by the pressure vessel manufacturer. Do not strike fittings or threads.</p>
<p>8</p> 	<p>Fit the half-moon retaining segments and their fasteners as instructed for the pressure vessel. Check that both segments are fully seated in their grooves and that the end cap is secure.</p>

Step	Action
<p>9</p> 	<p>Insert the membrane from the feed inlet side. The end with the black V-shaped brine seal must be inserted last and remain at the inlet from the high-pressure pump. Check that the membrane's centre connection fits into the end cap connection as instructed. Consider marking the flow direction on the vessel.</p>
<p>10</p> 	<p>Fit the feed-side end cap and secure it in the same way as the first. Check that both end caps are locked.</p> <p>Fit the product water outlet to the centre port at whichever end best suits the installation, and fit the centre plug at the opposite end. Product water outlet position is independent of the high-pressure flow direction through the membrane.</p> <p>Check for leaks during start-up. If a fitting leaks, stop and depressurise the system before retightening. Follow the pressure vessel instructions to prevent the end cap from rotating.</p>

9 Connecting water lines and hoses

Hose routing

Follow the hose diagram for the supplied system. Consider labelling hose ends and connect one flow path at a time. Protect hoses from abrasion, heat and tight bends. Do not let fittings carry the weight of hoses or be subjected to side loads.

High-pressure hoses run between the pump, pressure vessel and panel as shown in the diagram. Any excess length can be arranged in gentle loops within the permitted bend radius. Secure hoses to prevent vibration causing abrasion or unwanted noise.

Component and image	Mounting and connection																																																
<div>High-pressure hose</div> <div></div>	<div>Observe the minimum permitted bend radius of 40 mm and prevent abrasion. Supplied lengths are listed in the picking list.</div> <div><table><tr><th>Property No.</th><th>Property</th><th>Property data</th></tr><tr><td>362</td><td>Application</td><td>Industrial and</td></tr><tr><td>363</td><td>Operating temperature</td><td>−40 °C to +1</td></tr><tr><td>364</td><td>Working pressure</td><td>31.0 MPa</td></tr><tr><td>365</td><td>Reinforcement</td><td>One steel bra</td></tr><tr><td>383</td><td>Pack quantity</td><td>1</td></tr><tr><td>389</td><td>Internal diameter I.D.</td><td>6.5 mm</td></tr><tr><td>390</td><td>Inner tube</td><td>Polyamide PA</td></tr><tr><td>391</td><td>ISO standard</td><td>Exceeds EN 8</td></tr><tr><td>398</td><td>Min. bend radius</td><td>40 mm</td></tr><tr><td>400</td><td>Nominal bore</td><td>DN 6</td></tr><tr><td>408</td><td>Burst pressure</td><td>124 MPa</td></tr><tr><td>414</td><td>Outside diameter O.D.</td><td>11.7 mm</td></tr><tr><td>415</td><td>Outer cover</td><td>Polyurethane</td></tr><tr><td>417</td><td>Approval</td><td>MSHA</td></tr><tr><td>423</td><td>Colour</td><td>Black</td></tr></table></div>	Property No.	Property	Property data	362	Application	Industrial and	363	Operating temperature	−40 °C to +1	364	Working pressure	31.0 MPa	365	Reinforcement	One steel bra	383	Pack quantity	1	389	Internal diameter I.D.	6.5 mm	390	Inner tube	Polyamide PA	391	ISO standard	Exceeds EN 8	398	Min. bend radius	40 mm	400	Nominal bore	DN 6	408	Burst pressure	124 MPa	414	Outside diameter O.D.	11.7 mm	415	Outer cover	Polyurethane	417	Approval	MSHA	423	Colour	Black
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Push-fit connectors for low-pressure tubing

1. Cut the tubing square with the tube cutter. The end must be clean and undamaged.
2. Push the tubing fully into the fitting, past the seal and up to the stop. Check the specified insertion depth.
3. Gently pull the tubing to check that it is locked. Check for leaks when first filling with water.
4. To disconnect: depressurise the system, push in the fitting's release collar and pull out the tubing.

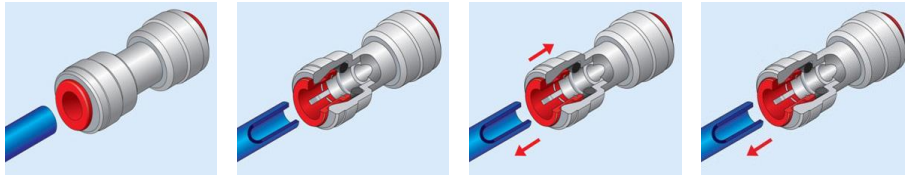


Figure 09 Insertion, sealing, pull check and release of a push-fit connector.

Non-return valves

Check the flow arrows and install the non-return valves as shown in the hose diagram. Do not confuse colour markings with flow direction. Ensure that flushing water and feed water flow in the intended direction.

Non-return valve – flow direction

The red ring marks the outlet.





10 Water connections and panel

Feed water and prefilters

Connect the seawater inlet through a coarse strainer to the seawater pump. Then connect the prefilters and high-pressure pump feed as shown in the hose diagram. Check the filter head inlet and outlet ports before connecting hoses.

Connect the low-pressure gauge sensing line to the specified point between the prefilters and high-pressure pump. The pressure sensor location must be shown in the same diagram.

High pressure and concentrate

Connect the high-pressure pump outlet to the pressure vessel feed inlet. Connect the vessel's concentrate outlet to the panel needle valve as shown in the hose diagram. Install the pressure relief valve and connect its discharge as described in Pressure relief valve.

Route concentrate to the designated discharge. Ensure that hose routing cannot block the discharge or create excessive backpressure.

Product water and flushing

Connect the membrane product water outlet to the panel's measuring devices and then to the sample/tank selector. Provide an accessible sample outlet so that the initial product water can be diverted during start-up.

The installation must prevent static backpressure on the membrane's product water side, including when the system is off. Follow the hose diagram for the product water connection.

Connect tank water through the carbon filter and flushing pump as shown in the hose diagram. Install the three-way valve for an external container so that it can be used for preservation. Label the valve ports and positions.

Routine flushing, preservation and frost protection are described in the user manual. During installation, check that the intended drain and disconnection points are accessible.

Three-way valves and connections

1 PRODUCT WATER



Select sample outlet or water tank.

2 FLUSHING / PRESERVATION



Select tank water or preservation solution.

Arrows show possible flow directions. Only one flow path is used at a time.

The upper connection is shown here as the common port.
Check the port function on the supplied valve.

FLUSH – rear connections

High-pressure connection 1 · All other marked connections are low pressure

1 HIGH-PRESSURE INLET

From the pressure vessel,
via the high-pressure gauge
to the needle valve.

2 CONCENTRATE OUTLET

Brine to discharge.

5 PRODUCT WATER OUTLET

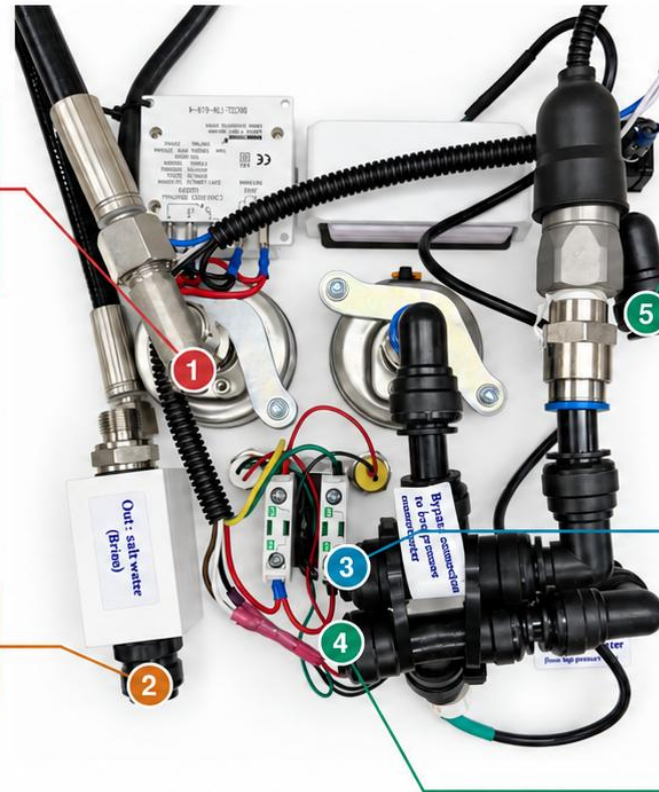
To the water tank,
after the flow meter.

3 FEED PRESSURE

Bypass connection to the
low-pressure gauge and
pressure sensor.

4 PRODUCT WATER INLET

Product water from the
pressure vessel, via the TDS
sensor and flow meter.



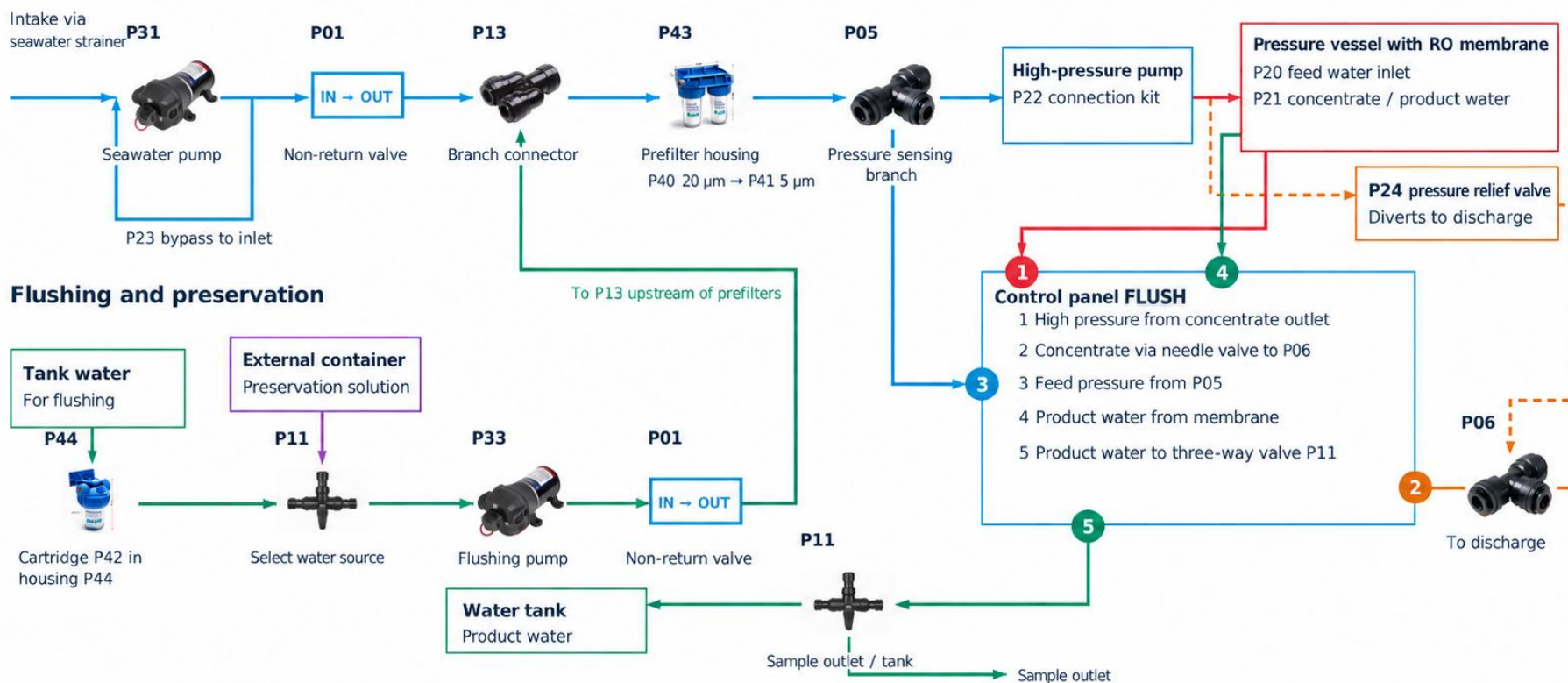
Connect hoses according to the hose diagram for the supplied configuration.

Hose diagram FLUSH

Modular system with separate flushing pump

→ Feed water / supply
 → High pressure
 → Product / flushing water
 → Concentrate / discharge
 → Preservation

Seawater and water production



P references identify items in the component list. Crossing lines without a dot are not connected.
 P07 and P10 connection fittings are not shown separately. R38 is used only with twin pressure vessels.

BOX • UNDERSIDE CONNECTIONS

High-pressure connection 1. All other marked hose connections are low pressure.

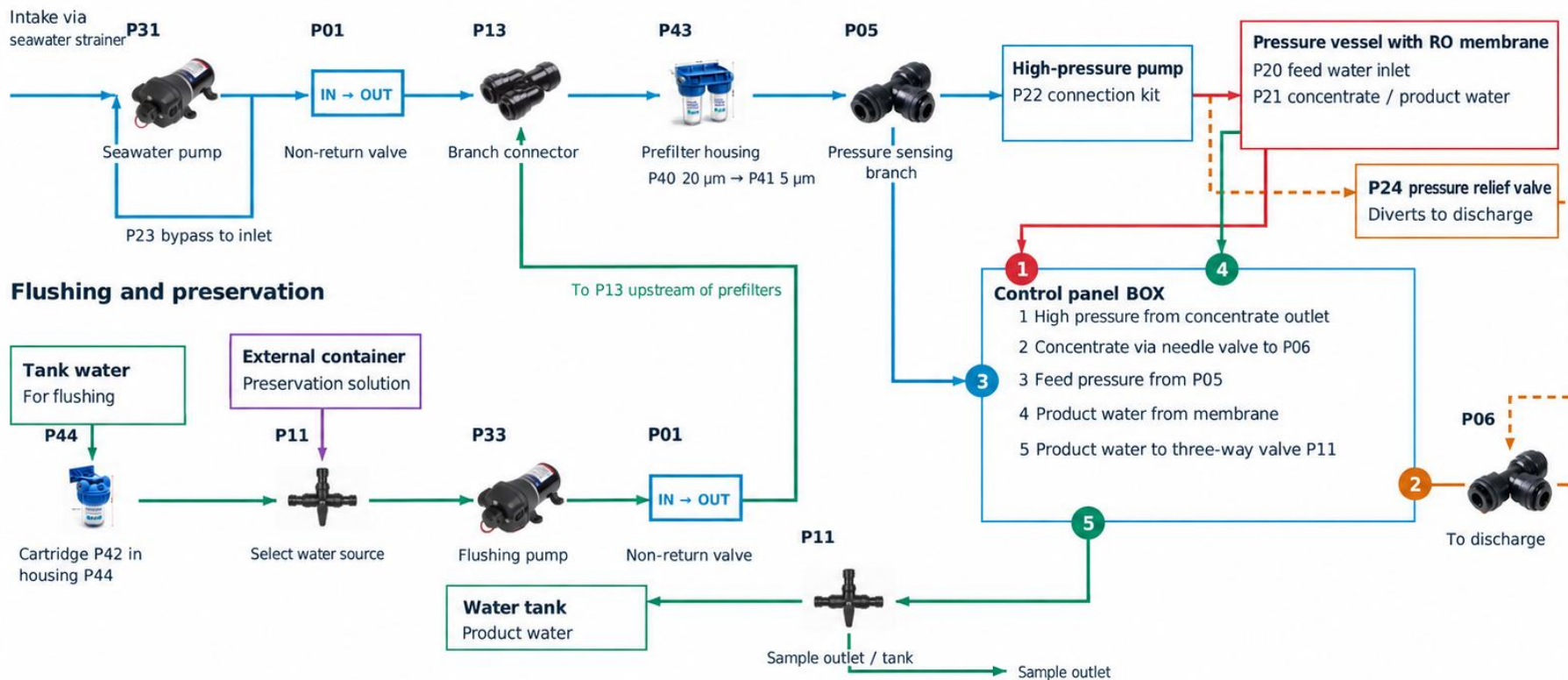


Hose diagram BOX

Modular system with separate flushing pump

→ Feed water / supply
 → High pressure
 → Product / flushing water
 → Concentrate / discharge
 → Preservation

Seawater and water production



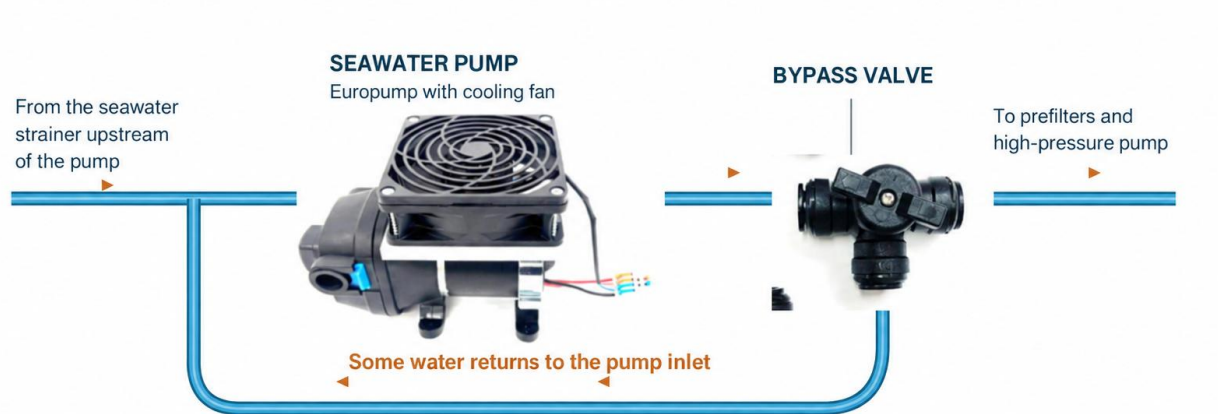
P references identify items in the component list. Crossing lines without a dot are not connected.
 P07 and P10 connection fittings are not shown separately. R38 is used only with twin pressure vessels.

11 Seawater pump bypass

Install the bypass kit as shown in the applicable hose diagram. The bypass returns part of the flow from the pump outlet to its inlet. The valve adjusts the feed to the high-pressure pump.

Seawater pump bypass

Europump with cooling fan and bypass valve



The photographs show the components. Hose routing and connections are schematic.

Install according to the hose diagram for the supplied kit.

Adjust feed pressure at the high-pressure pump according to the system data sheet.

Adjust the bypass after bleeding the system and establishing normal operation. Read the feed pressure at the high-pressure pump. The guideline value is approximately 1 bar during operation; follow the system data sheet. Check that the water supply is stable.

The booster pump must supply enough water to the high-pressure pump without creating unnecessarily high pressure. This reduces current consumption and heat generation.



12 Needle valve

Function and location

The needle valve (pressure regulating valve) is mounted on the control panel. It restricts flow on the concentrate side (brine discharge), creating the high operating pressure in the vessel required for reverse osmosis.

Connect the pressure vessel concentrate outlet to the needle valve inlet as shown in the system hose diagram. Route the needle valve outlet to the concentrate discharge overboard.

Important safety instructions

Do not start the high-pressure pump with the needle valve closed. Pressure can rise rapidly and cause surges that damage the membrane and pressure vessel.

Adjustment during start-up and operation

The needle valve controls the system's operating pressure. Always increase pressure gradually and very slowly during start-up.

1. Open the needle valve before starting. For the configuration described, approximately one turn from closed is sufficient; follow the instructions for the supplied valve.
2. Fill and bleed the low-pressure side with the high-pressure motor power supply isolated, as described in Initial start-up and functional checks. Start the high-pressure pump only once the water supply is stable.
3. Increase the operating pressure slowly by turning the needle valve clockwise in small steps. Monitor the pressure gauge and product water flow throughout.
4. Adjust to normal operating pressure as specified in the supplied system data sheet. Never exceed the maximum allowable system pressure or maximum product water flow for the supplied model.



13 Pressure relief valve

Pressure relief valve P24 limits the high pressure by diverting water to the discharge. Install the valve and its discharge as shown in the system data sheet and hose diagram. It may be factory-fitted to the high-pressure pump.

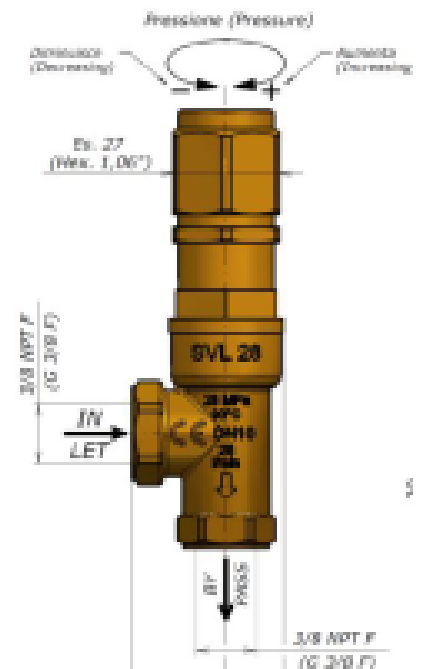
Check the setting during initial start-up. If the valve opens before normal operating pressure is reached, its setting may be too low. Do not try to compensate by closing the needle valve further.

The opening pressure must match the system data sheet and be above normal operating pressure without exceeding the system's allowable pressure. Operating pressure and opening pressure are different values.

Check the valve model and specified opening pressure before adjustment. If this information is missing, obtain it from MAB before pressurising the system for adjustment.

Adjusting the supplied valve

The image shows an SVL28 example. On the illustrated version, turning the upper nut clockwise raises the setting and turning it anticlockwise lowers it. The lower, thin nut locks the setting. Always follow the instructions for the valve model actually supplied.



Checking opening pressure

1. Bleed the system and ensure a stable water supply, an open needle valve and an unrestricted relief valve discharge.
2. Set and test the valve in accordance with its manufacturer's instructions, using the opening pressure in the system data sheet. If it opens too early, correct the setting as instructed before increasing pressure further.
3. Lock the setting as instructed and recheck the opening pressure. Then restore normal operating pressure using the needle valve.

Check for leaks and record the valve model and verified opening pressure in the installation record. Never exceed the system's allowable pressure during testing.



14 Electrical installation and control

The system has two separate supplies: one for the control panel, control unit and low-pressure pumps, and one for the high-pressure motor. Check component rated voltages and follow the wiring diagram for the supplied configuration.

Isolate both supplies before making connections or servicing.

Control panel and low-pressure pump supply

Connect the controls and low-pressure pumps through the supplied main switch marked 20 A. This circuit also supplies automatic flushing.

The supply must be able to remain on when the boat's other loads are switched off. Connect it as a separate, fused circuit that is not disconnected by the main switch for the boat's other loads.

Label the switch clearly, for example WATERMAKER CONTROLS AND FLUSHING.

20 A is the switch's rated current. Select the supply fuse and cable size according to the wiring diagram and connected load.

12 or 24 V DC high-pressure motor

Connect the high-pressure motor to a separate power supply from the battery bank with its own fuse. This fuse is not included in the kit.

Connect the power supply and motor control connections as shown in the wiring diagram. Select cable size according to motor current and cable length. The fuse must protect the cable and accommodate normal motor starting.

230 V AC high-pressure motor

Connect the high-pressure motor to the boat's 230 V system, supplied by shore power, an inverter or a generator.

Follow the wiring diagram for power, control, protective earth and electrical protection. The control panel and low-pressure pumps have a separate supply even when the high-pressure motor runs on 230 V.



Low-pressure pump currents and fuses

Use the pump's maximum current when sizing the electrical installation, even if current consumption is lower during normal operation.

Pump model	Voltage	Max. current	Fuse per pump data sheet
16.512.12	12 V	5 A	6 A
16.512.24	24 V	3 A	6 A
16.518.12	12 V	15 A	16 A
16.518.24	24 V	8 A	16 A

Fuse ratings apply to each individual pump, not to the complete control system supply. Size the common supply for all components that can operate simultaneously.

Power supply during automatic flushing

Leave the supply to the control panel, control unit and flushing circuit on during shutdowns if automatic flushing is required.

The high-pressure motor power supply need not be on for automatic flushing. The boat's other loads may also be switched off.

Checks before starting and servicing

Before the first start:

Check that every component receives the correct voltage and that DC polarity is correct.

Check fuses, cable connections and strain relief.

Check protective earth and electrical protection on the 230 V version.

Check that power supplies and their switches are clearly labelled.

Before servicing, isolate both the control supply and the high-pressure motor supply.

Stopping the watermaker at the control panel alone does not prevent timer-controlled flushing from starting.



15 Cable sizing for DC high-pressure motors

The table below provides guidance on cable cross-sectional area for low voltage drop.

Distance is the one-way cable run from the battery bank to the motor. The calculation includes both positive and negative cables. Use the same cross-sectional area for both.

Motor	Voltage	Current	Up to 2 m	Up to 4 m	Up to 6 m	Up to 8 m
½ hp	12 V	38 A	16 mm ²	35 mm ²	50 mm ²	70 mm ²
¾ hp	12 V	59 A	25 mm ²	50 mm ²	70 mm ²	95 mm ²
1 hp	12 V	81 A	35 mm ²	70 mm ²	95 mm ²	150 mm ²
½ hp	24 V	19 A	6 mm ²	10 mm ²	16 mm ²	16 mm ²
¾ hp	24 V	29.5 A	6 mm ²	16 mm ²	25 mm ²	25 mm ²
1 hp	24 V	40.5 A	10 mm ²	16 mm ²	25 mm ²	35 mm ²

The 12 V current values correspond to the stated motors' rated currents. The 24 V values are calculated as half the current. Always check the fitted motor's nameplate.

Cable areas are calculated for approximately 2% maximum voltage drop in the cables at the stated current, with a temperature allowance for the copper conductor. Voltage drop across fuses, switches and connections is additional.

Also check the cable's current-carrying capacity for the installation method and the motor starting current. If the installation requires a larger cable, use the larger size. Runs longer than 8 metres require a separate sizing calculation.

16 Control unit and external connections

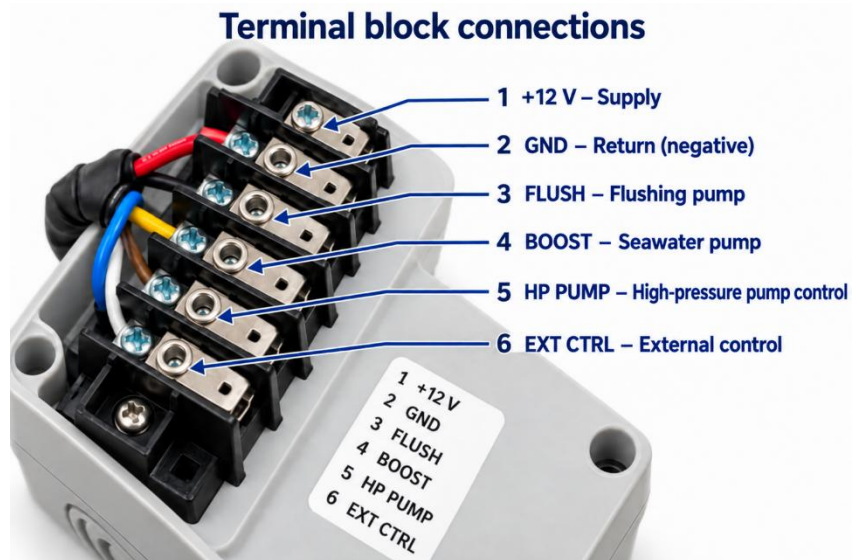
Control panel and terminal block

The control panel connects via a Deutsch connector to the separate control unit, which contains the Finder relay and terminal block. Check connector markings against the wiring diagram.

Connect pumps and sensors according to the terminal schedule. Identify conductors by terminal or pin number; cable colour alone is not sufficient.

The image shows the terminal connection side of a 12 V version.

For a 24 V version, the supply and connected components must match the system data sheet. The Deutsch connector pinout is given in the supplied wiring diagram; do not confuse it with the terminal numbers below.



Connection	Terminal	Function and cable identification
+12/24 V supply	1	Positive, according to configuration
GND / negative	2	0 V, common return (negative)
Flushing pump	3	Yellow cable
Seawater pump and cooling fan	4	Green cable
High-pressure pump control	5	White cable
External control	6	Optional, blue cable. Signal type and connection as shown in the option's wiring diagram.



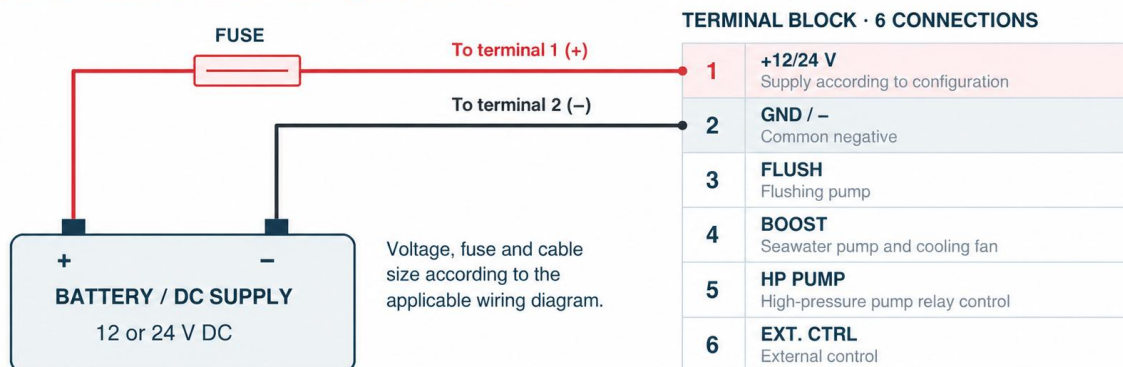
Connection illustrations for the supplied configuration

1 Control unit supply

Positive via a fuse to terminal 1. Negative to terminal 2. Follow the wiring diagram for voltage, fuse and cable size. Keep the relevant circuits powered for automatic flushing. Isolate all supplies before work.

Control unit power supply

DC supply · Positive to terminal 1 and negative to terminal 2



Principle diagram · Terminal positions are schematic.

Automatic flushing requires the necessary power supply to remain on.

Label supplies that must remain on for automatic flushing.

Isolate all supplies before working on the control unit, including any separate supply.

2 Seawater pump and cooling fan

Connect according to the applicable terminal schedule. Check polarity and that the cooling fan runs with the seawater pump.

Seawater pump with cooling fan

Europump · Connection to control unit terminals 4 and 2



Connect the pump and cooling fan in parallel to 4 (+) and 2 (–).

Terminal 6: EXT. CTRL. Connect external equipment according to the separate wiring diagram.

Check pump rated voltage and connection markings against the applicable wiring diagram.

3 Flushing pump

Connect according to the applicable terminal schedule. Check pump voltage and polarity.

Flushing pump

Europump · Connection to control unit terminals 3 and 2

EUROPUMP



Product photograph · Connections are schematic.

— To terminal 2 (—)

— To terminal 3 (+)

TERMINAL BLOCK · 6 CONNECTIONS

1	+12/24 V Supply according to configuration
2	GND / — Common negative
3	FLUSH Flushing pump
4	BOOST Seawater pump and cooling fan
5	HP PUMP High-pressure pump relay control
6	EXT. CTRL External control

Connect the flushing pump to 3 (+) and 2 (—).

Terminal 6: EXT. CTRL. Connect external equipment according to the separate wiring diagram.
Check pump rated voltage and connection markings against the applicable wiring diagram.



4 High-pressure motor 12 or 24 V DC

Connect the relay box control input to terminal 5 (HP PUMP, +) and terminal 2 (GND/-). The motor receives a separate, fused power supply through the relay box. Motor current must not pass through the control unit terminal block. Follow the wiring diagram for cables, fuse and contactor. Isolate both power and control supplies before work.

High-pressure motor – control and power supply

12 or 24 V DC · Voltage according to supplied configuration

CONTROL UNIT TERMINAL BLOCK

1	+12/24 V Supply according to configuration
2	GND / - Common negative
3	FLUSH Flushing pump
4	BOOST Seawater pump and cooling fan
5	HP PUMP High-pressure pump relay control
6	EXT. CTRL External control

CONTROL CIRCUIT

Terminal 5 (HP PUMP) controls the relay.
Terminal 2 is common negative.

The control output supplies the relay,
not the high-pressure motor.

SEPARATE POWER CIRCUIT



Principle diagram. Relay box internal wiring and connection points are shown in the applicable wiring diagram.

Follow the wiring diagram for fuse and cable size. Isolate both motor power and control supplies before work.

5 High-pressure motor 230 V AC

Connect the motor power cable to an earthed 230 V socket. Connect the switch's DC control to terminal 5 (HP PUMP, +) and terminal 2 (GND/–) as shown in the wiring diagram. Unplug the motor and isolate the control supply before work.

High-pressure motor – 230 V AC

Separate DC control and 230 V AC motor power supply

CONTROL UNIT TERMINAL BLOCK

1	+12/24 V Supply according to configuration
2	GND / – Common negative
3	FLUSH Flushing pump
4	BOOST Seawater pump and cooling fan
5	HP PUMP High-pressure pump relay control
6	EXT. CTRL External control

CONTROL CIRCUIT · DC

Terminal 5 (HP PUMP) controls the relay.
Terminal 2 is common negative.

The control output supplies the relay,
not the high-pressure motor.

Control voltage according to supplied
configuration.

SEPARATE POWER CIRCUIT



Principle diagram. Follow the applicable wiring diagram for connections, protection and cable size.

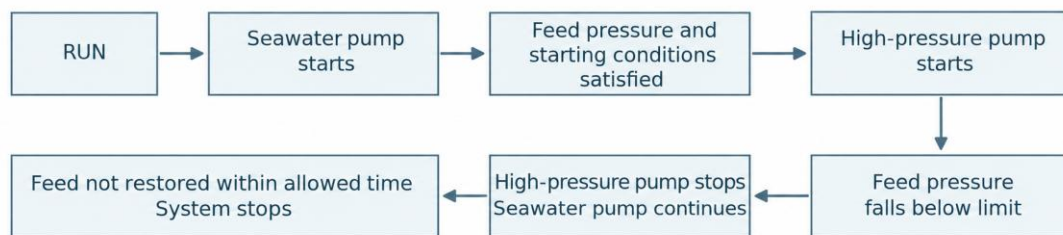
Isolate both the 230 V motor power supply and DC control supply before work.

17 Control logic and protection

RUN and FLUSH

RUN starts the seawater pump and requests production. The high-pressure pump starts when feed pressure and starting conditions are satisfied. FLUSH requests flushing. See the user manual for panel operation.

The overview shows the main sequence. Pressure limits, timings and restart behaviour must match the installed program version.



Restart follows the control unit program version.

FLUSH requests the programmed flushing sequence.

Indicators: green for RUN, orange when the high-pressure pump is running, and yellow for FLUSH. External control and tank-full functions follow the installed option's instructions.

Typical values are approximately 3 s start delay, a low-pressure threshold around 0.3–0.5 bar and a 20 s recovery attempt. Exact thresholds, timings and restart behaviour are specified in the documentation for the installed program version and must be recorded during commissioning.

Functional testing

After filling and bleeding, test starting, normal stopping, flushing and installed options. Check that the high-pressure pump receives a start signal only when feed pressure and all other starting conditions are satisfied.

Test low-pressure protection as instructed in the wiring diagram and program documentation. Keep the high-pressure motor power supply isolated when testing sensor signals and control outputs. Check that low pressure inhibits starting and verify stop/restart logic. Do not induce dry running by restricting water to a running pump.

Disable timer and external start functions as instructed before testing or service. Isolate both supplies before disconnecting wires. Restore connections and settings after testing, check normal operation and record the results. Do not leave any protection bypassed.

18 Initial start-up and functional checks

Checks before filling

1. Check mountings, hoses, flow directions and fittings against the diagram. Pay particular attention to end cap locking.
2. Check the pump oil level and the specified dipstick or breather plug.
3. Check electrical connections, fuses and protection. Disable timer and external start functions as instructed. Keep the high-pressure motor power supply isolated during filling.
4. Set the product water three-way valve to the sample outlet or collection container. Do not route initial rinse water to the tank.
5. Open the needle valve. Check that discharge paths are clear and prepare to collect water at bleed points.

Check that the membrane product water line has an unrestricted outlet and that preservative can be discharged without entering the drinking water tank.

Priming the booster pump and flushing pump

If a low-pressure pump does not deliver water, air may need to be released through its outlet connection.

Carry out the following for the seawater pump, then the flushing pump:

Keep the high-pressure motor power supply isolated. The controls may be powered: RUN operates the seawater pump and FLUSH operates the flushing pump.

Priming the low-pressure pump



1. Stop the pump and depressurise the line. Disconnect the outlet; leave the suction line connected to the water source.
2. Collect escaping water and protect electrical components from spills.
3. Select RUN or FLUSH as appropriate. Run until water flows steadily without bursts of air. Stop if no water appears; the pump must not run dry.
4. Stop the pump and reconnect the outlet line.
5. Restart and check for leaks. Bleed the prefilter housings and check for a stable water supply to the high-pressure pump.



Stop the pumps before reconnecting the high-pressure motor power supply.



Rinsing a new membrane and first production

1. Follow the rinsing instructions for the installed membrane, including specified pressures, flows and durations. Do not start production until the water supply is stable and the system has been bled.
2. Check that the needle valve is open. Reconnect the high-pressure motor power supply and select RUN. Then raise pressure slowly as specified in the system data sheet and check for leaks, feed pressure and product water flow.
3. Discard all product water during the new membrane's first hour of operation. Do not route it to the drinking water tank. Rinse for longer if required by the membrane manufacturer.
4. Route product water to the tank only after rinsing is complete and readings meet the conditions in the system data sheet and user manual. A low TDS reading does not replace the specified rinsing procedure.
5. Check bypass feed pressure and the relief valve setting as described in their chapters. Test stopping, protection and flushing as described in Control logic and protection.
6. Record operating readings, protection tests and any deviations in the installation record. Restore the timer and installed options to their intended settings.

Water temperature must not exceed 45 °C. Use chlorine-free flushing water and only chemicals approved for the installed membrane.



19 Installation record

Complete this record during initial start-up and keep it with the system documentation.

Identification	Details
Customer and boat	
System model and serial number	
Pump and membrane	
Date and installer	
Hose diagram and revision	
Wiring diagram and program version	

Check	Result or notes
Mounting and service access	
End cap locks, hoses and leak check	
Oil level and breather plug	
Power supply, fuses and connections	
Bleeding and stable water supply	
New membrane rinsing completed	
RUN and normal stop	
Low-pressure protection and restart	
Documented relief valve setting	
FLUSH and timer	
Installed external functions	

Operating parameter	Measured value
Feed water temperature and salinity	
Feed pressure and operating pressure	
Product water flow and TDS	
Operating voltage and motor current	

Deviations and corrective action: _____

Installer's signature: _____



20 Service and technical troubleshooting

Preparing for service

1. Isolate all power supplies and prevent automatic starting.
2. Close the seawater inlet before opening the intake side.
3. Release pressure and check that the system is depressurised before dismantling.

Record symptoms and operating readings before work when safe to do so. Label hoses and cables. Protect open connections from dirt.

High-pressure pump and motor

Check oil level, oil and water leaks, mountings, ventilation, fans and cables. Follow the correct Comet instructions for oil and service intervals.

Identify the pump model before ordering seals or spare parts. Use the parts list for that model.

Use the Comet instructions corresponding to the pump model. Record the pump model and instruction document number or revision in the service log.

MAB-specific service checks include hoses and mountings, cooling fan operation, stable water supply, bypass, pressure relief valve and relevant control protection. Record completed work and operating readings after service.

Replacing the RO membrane

1. Follow Preparing for service.
2. Disconnect the necessary connections and remove the end cap retainers and cap as instructed for the vessel.
3. Remove the membrane. Check seals, end caps and the inside of the vessel.
4. Install as described in Pressure vessel and RO membrane. Check flow direction and end cap locking.
5. Fill, check for leaks and rinse as described in Initial start-up and functional checks before routing product water to the tank.

Filters and electrical components

Filter replacement is described in the user manual. Bleed and check for leaks after work on the filters.

When replacing a sensor, relay or contactor, check its designation, voltage and function against the wiring diagram. Save and identify the Finder program version before replacing the control unit. Test the relevant protection after work.

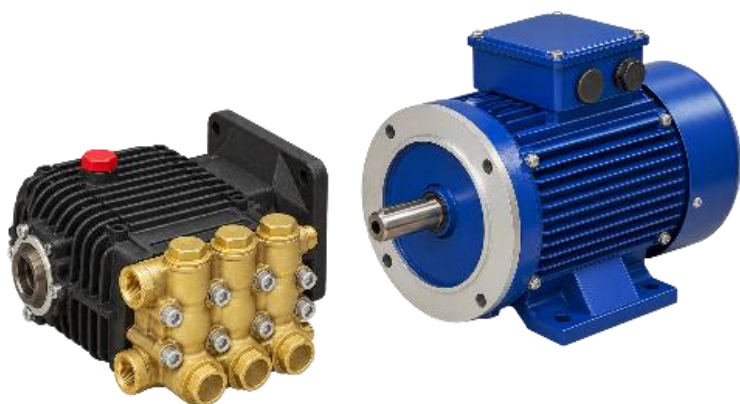
See the user manual for preservation, frost protection and restarting after storage.

21 High-pressure pump oil and maintenance

This table applies to Comet LW. Check the pump model on its nameplate. For other models, follow their supplied Comet instructions for oil, quantity and service intervals.

Item	Comet LW
Oil	Non-detergent ENI Multitech THT or an equivalent specified by Comet
Oil quantity	Approximately 0.32 litres. Fill to the specified level.
Oil supplied	0.5 litres
First oil change	After 50 operating hours
Subsequent oil changes	Every 500 operating hours or at least once per season

Use only oil that meets the pump instructions. Check the oil level before the first start and after changing the oil.



Example of pump and motor before assembly. Replace the pump's transport plug with the specified dipstick or breather plug before operation.

Alternative oils specified by Comet

Mobilfluid 424 or 426 · Shell Spirax S4 TXM · Castrol Agri Trans Plus 80W · Total Dynatrans MPV · Q8 Roloil Multivariac 35 HP.

Follow the pump instructions for filling, checking the level and draining. Collect used oil and take it to an appropriate recycling facility.



22 Troubleshooting and measurement points

Troubleshoot in the right order

Check the water and power supplies first. Then check the sensor signal and control output before concluding that a pump or motor is faulty. Use the applicable wiring diagram.

Symptom	Check and next step
Seawater pump produces no pressure	Check that the inlet is open, inspect the coarse strainer, check for water in the pump head, suction-side air leaks and correct non-return valve orientation. Bleed as described in Initial start-up and functional checks.
High-pressure pump does not start	Check feed pressure at the pump. Then check the low-pressure sensor signal, starting conditions and control unit output against the wiring diagram.
High-pressure pump stops	Check whether feed pressure is falling. Inspect the inlet, filters, air ingress, bypass and seawater pump before restarting.
Control output present but motor does not run	Check motor power supplies, fuse, contactor and connections. Measure voltage under load using appropriate competence and equipment.
Low or variable production	Record operating pressure, feed pressure, feed water temperature, salinity and flow. Compare with baseline readings before assessing the membrane.
No flow during flushing	Check water in the tank, three-way valve position, carbon filter, non-return valves and flushing pump power supply.
Leaks or abnormal noise	Stop and depressurise the system. Check fittings and hose supports, and ensure vibration is not being transmitted to the boat's fittings.

Information for support

Provide the system serial number, pump model, voltage, control unit version and symptoms. Include installation photos and recorded pressure, flow, TDS and operating voltage readings where available.

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23 Appendix A Diagrams and drawings

The table identifies information included in this manual and documents supplied separately with the system. Check that each document's model, voltage and revision match the delivery. Record the documents and program version used in the installation record.

Document	Location and purpose
A1 Hose diagram	FLUSH and BOX diagrams are included in Water connections and panel. For HATCH and other configurations, use the supplied model-specific hose diagram.
A2 Wiring diagram	A model-specific wiring diagram is supplied separately. Connection illustrations in Control unit and external connections must be read together with that diagram.
A3 Terminal and pin schedule	The terminal overview is in Control unit and external connections. Deutsch pin numbers, signal types and model-specific details are given in the supplied wiring diagram.
A4 Dimensions and mounting	Panel overall dimensions and cut-out sizes are in Planning and mounting. Use any supplied dimensioned drawing for the actual configuration.
A5 Optional connections	Separate instructions are supplied for installed options, such as an external control panel, level sensor, automation module or display.
A6 Component instructions	Model-specific instructions for the pump, membrane, pressure vessel, relief valve and timer are supplied separately. Check the model and document revision.
A7 System data sheet	Supplied separately for the model and serial number. Specifies components, voltages, operating values, maximum system pressure and relief valve opening pressure.