



Reverse Osmosis Desalinators



H2O Series

Framed and Modular

Technical Specification

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System Summary

Production Capability: 36 Litre/Hr (0.87m³/Day) to 276 Litre/Hr (6.6m³ / Day)

Electrical Load: 1.5kW

Current Draw: Approx 8.2Amps at 230V

Standard Voltage: AC:- 230V-1 Phase

Alternative Voltages Available: 440V/3-Phase, 380V-3 Phase, 110V-1 Phase (all 50Hz or 60Hz)

System Design Parameters

Feed Water Flow: 13 Litre/Min (0.78m³/Day)

Feed water Pressure: 20 PSI (1.4BAR)

Salt Rejection: 98.6%

Working Pressure: 850PSI (58 BAR)

Feed Water Salinity: 35,000ppm NaCl, 25°C

Operating Water Temperature: 5°C to 35°C

Product Flow/Membrane Rating: +/-15%

Product Water Quality: <450ppm

System Outputs

Model	H202	H204	H206	H208	H2012	H2016
Capacity						
Litre/Hour	36	72	104	140	217	276
Tonne/Day	0.87	1.72	2.49	3.36	5.20	6.62
Weights (KG)						
Framed Unit	51	54	57	60	66	72
Modular	47	50	53	56	62	68

Principles of Reverse Osmosis

Reverse Osmosis (RO) is a low cost method of desalination, and is excellent for both marine and land based applications.

Osmosis is a naturally occurring process and is defined that when two solutions of different concentrations are separated by a semi-permeable membrane then the less concentrated (purer) water will flow towards the saltier (more concentrated) side of the membrane. This will happen until the pressures and concentrations are equalised.

The Cathelco Seafresh desalination plant reverses this process by pressurising salt water at double the natural osmosis pressure against the membrane surface, resulting in potable water being produced.

The principal of operation is such that the feed water has passed through a strainer (or similar) to ensure feedwater is free of large debris before entering the system. Sea water is pumped by a priming pump through a series of pre-filters to extract any free particles to a designed micron size according to the operating conditions.

The filtered feed water then passes through the high pressure pump which increases the pressure to 800 – 900 PSI (55-62 BAR) prior to entering the membrane(s).

Each membrane is held in the centre of a high pressure casing. The pressurised feed water is fed through the membranes and discharged through a pressure regulating valve to sea water discharge.

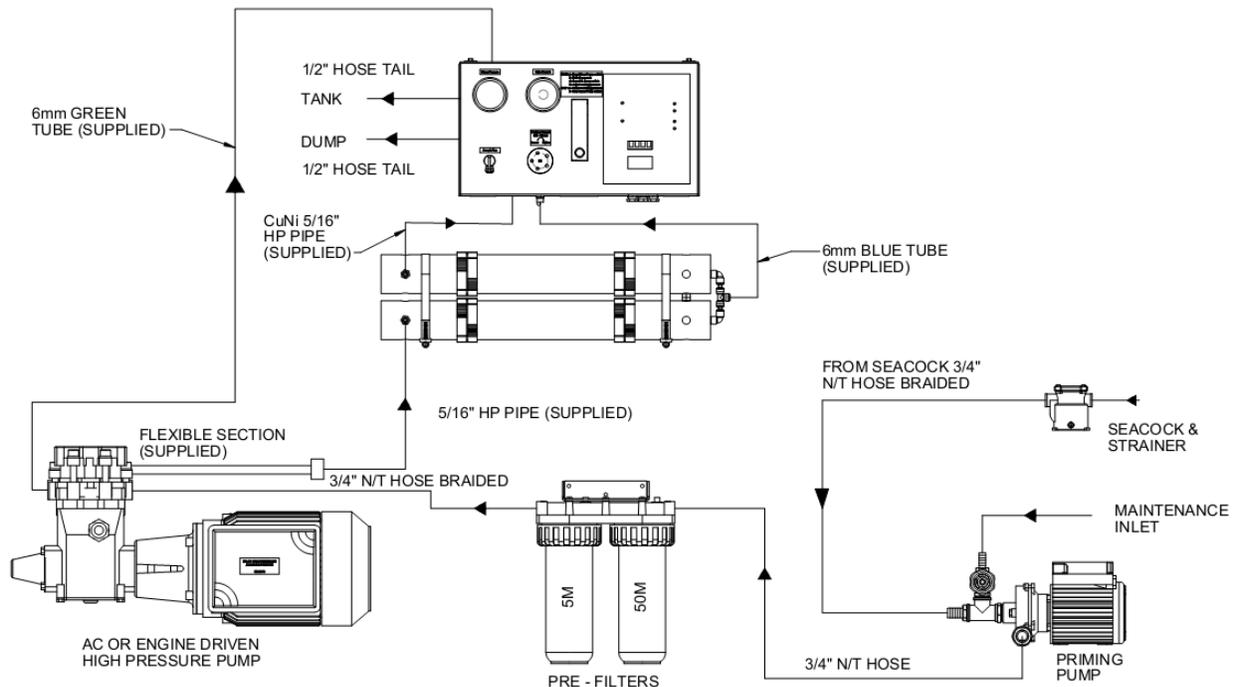
The product water which permeates through the membranes is piped through a salinity sensor to a solenoid valve which diverts the fresh water either to store or to dump depending on the quality. This operation is controlled by a temperature compensated controller set to reject water that is not well within the WHO directive of a maximum 500ppm salinity for potable water.

Although the product water is suitable for potable storage directly from the Cathelco Seafresh plant, it can be treated in various ways including ultra violet sterilisation, active carbon filtration, re-mineralisation and chlorination. These are available as optional extras and are detailed later in the document.

Product water without chlorine treatment tastes better but for long term storage chlorine dosing is advisable.

Every unit is manufactured to Cathelco Seafresh exacting standards, and is comprehensively tested prior to despatch to ensure safety and operational excellence.

System Schematic



Component Description

1. Primer Pump

This pump is installed on or below the waterline and forces water through the pre-filter units and deliver it to the high pressure pump with a positive pressure. The pump also features a maintenance inlet, used to introduce chemicals into the system.

Type: Single stage centrifugal

Materials: Aluminium motor housing, bronze pump body

Capacity: 0.78m³/hr

Speed: 2800rpm

2. Pre-filters

This consists of two disposable cartridge filters mounted in series fitted with bleed buttons for simple removal of air from the system. Firstly a 50 micron filter followed by 5 micron ensures “clean” water passes into the high pressure pump and pressure vessels to prevent damage. The clear filter housing makes it easy to see when the elements are in need of cleaning/replacing, this will be dependant on the quality of the feed water. Polyester elements are used instead of cotton as they are a poor host for bacteria and fouling.

Capacity: 1.0m³/hr

Filter cartridges: Polyester fibre elements, 50 micron and 5 micron 2.5" x 10".

3. High Pressure (HP) Pump

This is a triple plunger pump with ceramic plungers, corrosion resistant duplex stainless steel pump head and oil bath crankshaft in alloy crankcase. The AC pump motors are available either in close couple or belt driven variants. The belt drive offers a quieter alternative to the close coupled, with a volume of 75dB compared to 79dB from the close coupled, something to be considered if the pump is to be installed outside a sound dampened area, i.e. the engine room. Service interval: 5000hrs full overhaul

4. Pressure vessels and membranes

The pressure vessels are constructed of glass fibre epoxy resin and sealed with stainless steel reinforced nylon end plugs at either end. All salt water pipe fittings are Nickel Aluminium Bronze. The pressure vessels have been designed and tested to withstand more than 4x operating pressure. These can be arranged in a number of different ways depending on the output of the plant. The flow rate of one SW30 2540 membrane is the equivalent to two SW30 2521 membranes. Therefore models H204 and H208 are available in two separate options (see page 8)

Membrane type: Dow Filmtec SW30 2521 or SW30 2540 spiral wound

Chloride rejection: 99.5%

Max operating pressure: 1000 PSI (55-62BAR)

5. Control Panel

This features simple electronic controls for ease of operation. These features include:

- Electronic enclosure rated to IP55
- Feed pressure gauge to indicate clogging of pre-filters
- Restrict valve and high pressure gauge to regulate working pressure inside the membranes
- Fully automated salinity controller showing quality of product water in TDS
- Product flow meter showing fresh water flow in litres per minute
- Product water sample tap
- Hour meter
- Maintenance outlet valve to be used when carrying out chemical cleaning of system

6. Connections

3/4" Hose barb for sea water inlet from seacock and primary strainer to Primer Pump

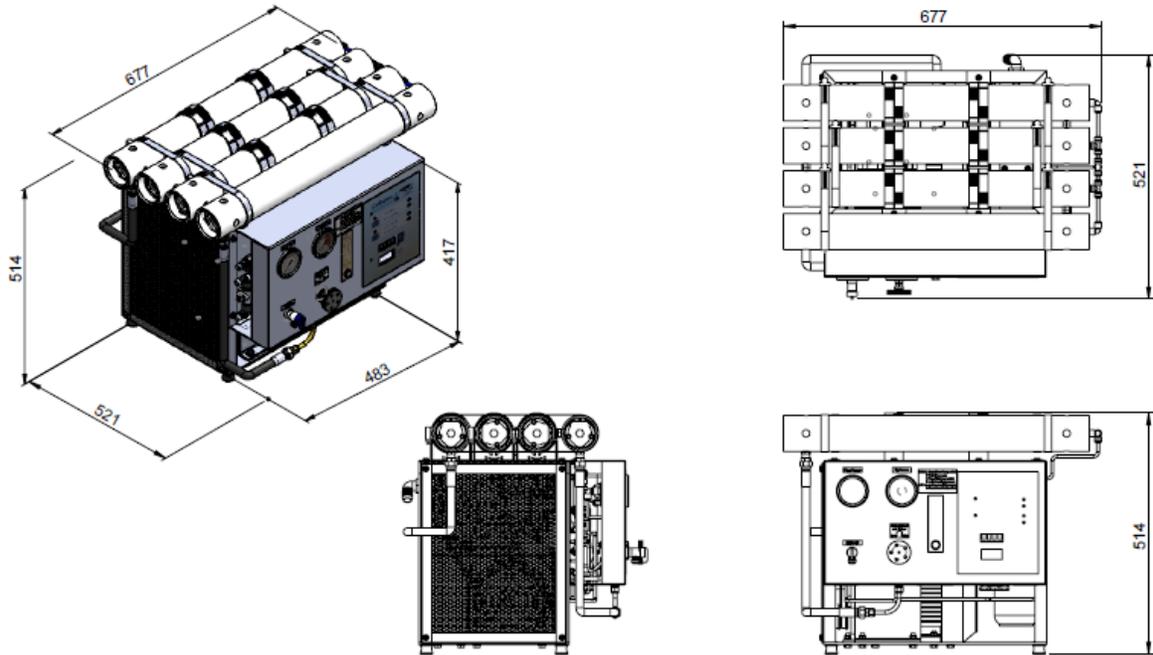
3/4" Hose barbs for pre-filter unit

1/2" Hose barb for brine discharge to overboard

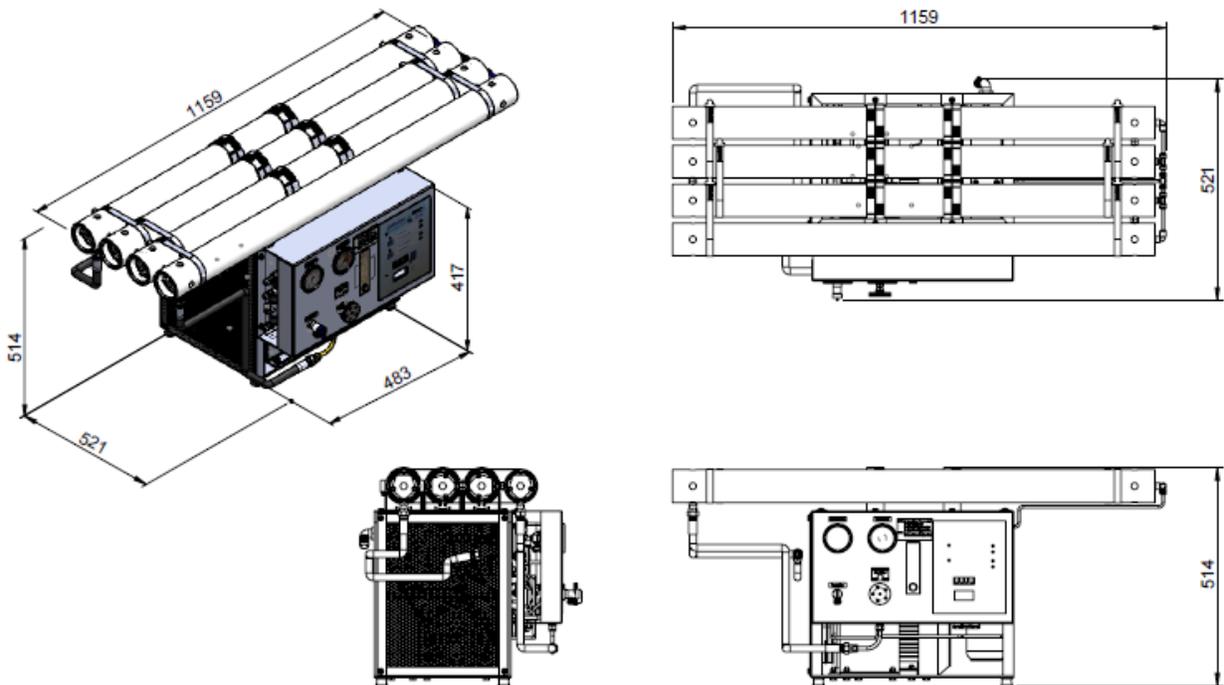
1/2" Hose barb for product connection to tank manifold

Dimensions (mm) - Framed Units

H202 to H208



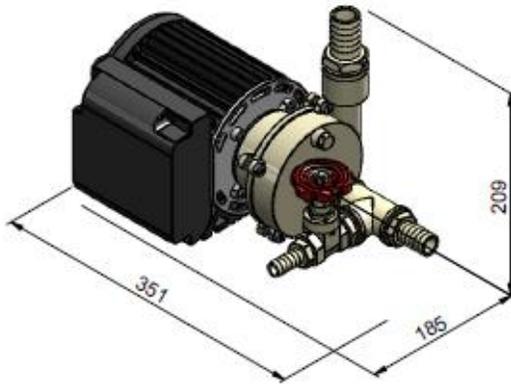
H208 2 PASS, H2012, H2016



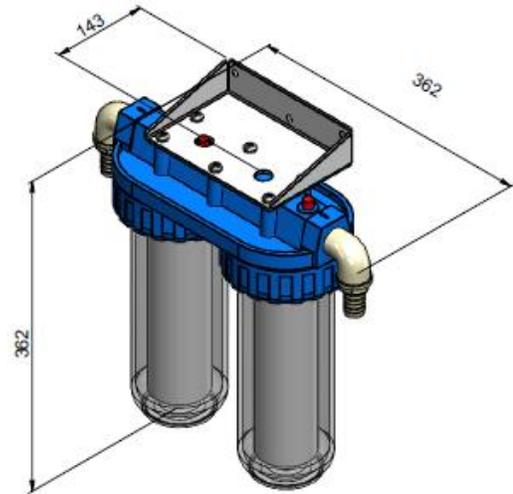
Note- On framed units the primer pump is supplied outside the frame

Dimensions (mm) - Modular Unit

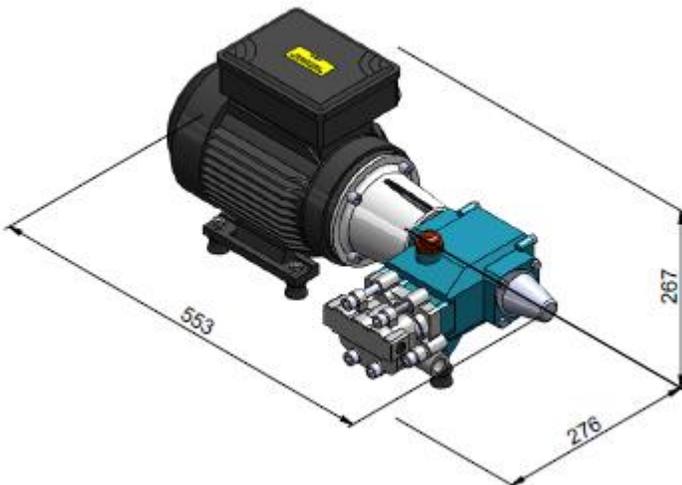
Primer Pump



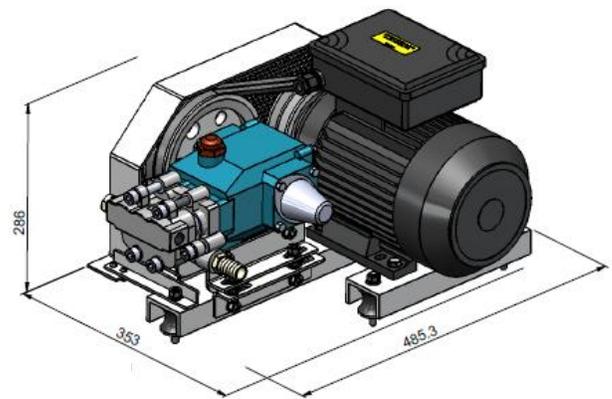
Pre-filters



High Pressure Pump Options

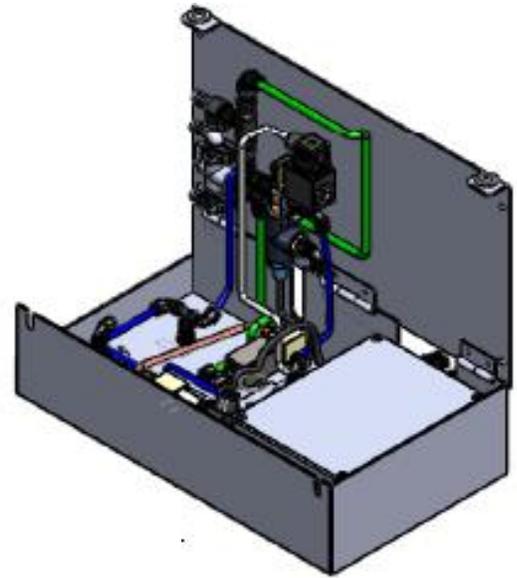
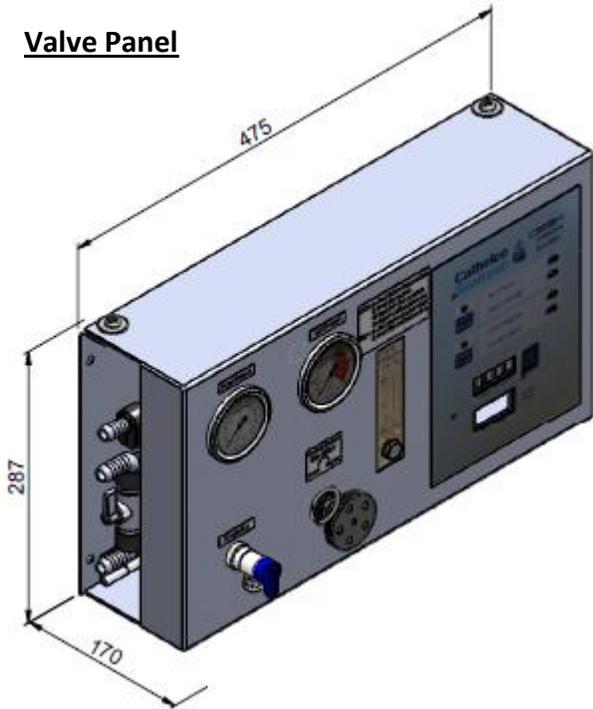


Close Coupled

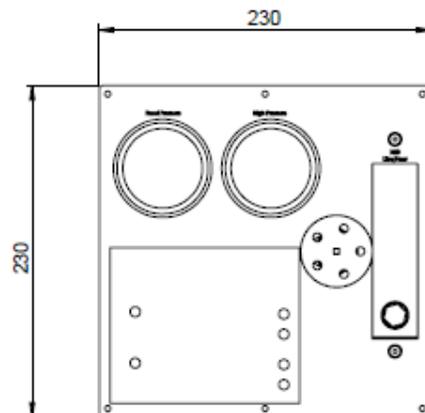


Belt Drive

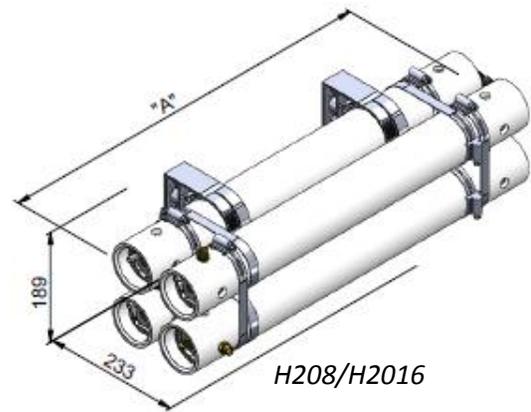
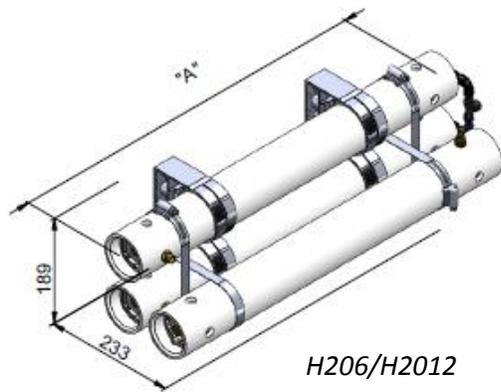
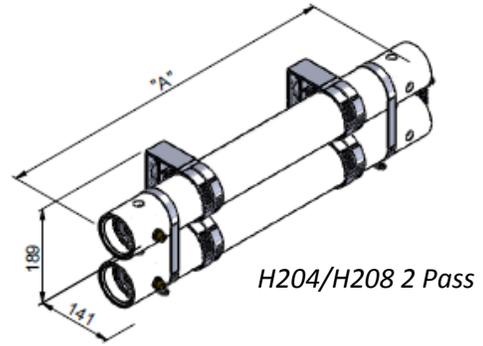
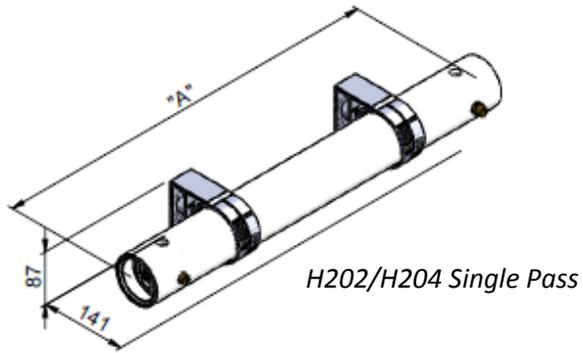
Valve Panel



Remote Control (Optional)



Pressure Vessels



Model	Dimension 'A' (mm)	Output Litre/Hour
H202	651	36
H204 Single Pass	1133	72
H204	651	72
H208 2 Pass	1133	140
H206	651	104
H208	651	140
H2012	1133	217
H2016	1133	276

Optional Extras

Remote Control: The control features and basic diagnostics are taken from the main control panel and mounted on this remote panel to allow the system to be operated from the bridge or other convenient location. The controls include both pressure gauges, the pressure regulator, the product flow meter and a switch/indicator keypad.

Fresh Water Flush: Upon system shutdown the fresh water flush unit flushes potable water through the system for 10 minutes on a weekly basis to remove any bacteria, minerals, etc. This ensures maximum operational efficiency and longevity of the R.O membranes.

Oil/water Separator: A pre-treatment option for use in water containing oil. The unit uses the same type housing as the standard pre-filters for compatibility and ease of replacement.

Media Filter: Commonly referred to as a sand filter because the filter media is borosilicate grit which looks like beach sand. This is a large diameter housing containing specially calibrated filter media. Particles present in the feed water get caught in the upper layers of the media. The flow through the housing can be reversed to flush the “dirt” out through the discharge pipe. This unit significantly lowers the consumption of the cartridge filter elements when the plant is operated in dirty water. Note, for systems using media a larger primer pump is specified.

UV Steriliser: The unit sterilises the water to be completely free from bacteria, parasites and algae spores. This can be used as a pre-treatment when operating in dirty waters and also as a post treatment if the water has been held in storage for long periods of time.

Chlorinator: The unit sterilises the water to be completely free from bacteria, parasites and algae spores. Chlorine is added to the product water (0.2-0.3mg/l in accordance with W.H.O rules on potable water) to sterilise it for storage for long periods of time.

Carbon Filter: Removes dissolved gases (incl. chlorine), tastes and odours to improve the taste of the product water. This unit uses the same housing as the pre-filtration cartridges for compatibility and ease of replacement.

Re-mineralisation Unit: Used to restore mineral content and restore equilibrium with alkalinity/CO2 levels. Also known as re-hardening or de-acidification.

For additional information or drawings on any of the above components please contact Cathelco Seafresh