



reef zlements®



HYBRID 2 PART DOSING SYSTEM™

Quick Start Guide





INTRODUCTION

Welcome to the Quick User Guide for the Reef Zlements Hybrid 2 Part (H2P™) Dosing System.

Reef Zlements is excited to introduce you to this cutting-edge solution, developed to ensure the health and vitality of your marine ecosystem.

The Reef Zlements H2P™ Dosing System is a holistic approach and methodology designed with the ethos that reefers should provide the best conditions in their aquariums and meet all the nutritional needs of their corals to keep a healthy aquarium. The H2P™ system ensures that your corals thrive by providing a complete nutrient solution.

The H2P™ Dosing System can control alkalinity and pH independently, whilst supplying all other nutrients necessary for a healthy reef. This groundbreaking system ensures that reefers can keep their water chemistry exactly where it needs to be, so that corals will grow healthier and faster, and you have the confidence that your corals are getting a complete, balanced nutritional program.

This document is a simplified version of the full H2P™ Dosing System manual, available to those interested in the science behind the H2P™ method, and gives you all the knowledge required to understand, start, and maintain an aquarium using the H2P™ Dosing System.

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H2P™ DOSING SYSTEM OVERVIEW

The H2P™ Hybrid Two Part Dosing System consists of two main components:

Part 1: Complete/pHplus

This vital component consists of two interchangeable solutions, Complete and pHplus, each designed to increase alkalinity and enrich your reef aquarium with a comprehensive blend of macro and trace elements. Each litre contains 10,000 dKH units, and a 10 mL dose can raise the alkalinity of 100 litres of water by 1 dKH.

The two solutions differ in the effect that continuous use will have on the pH of your water.

- **Complete:** Ensures optimal alkalinity whilst gently elevating pH.
- **pHplus:** Ensures optimal alkalinity whilst actively increasing pH.

Custom Blending – mix Complete with pHplus to tailor the pH balance to your aquarium's needs. Dose them together or separately for pH adjustment and control.

Part 2: Universal

Universal is the new name for a common Part 2 solution (replacing Complete Part 2 or pHPlus Part 2), as it can be used universally with both products. It is an essential part of the Reef Zlements H2P™ Dosing System and contains approximately 72,000 mg/L of Calcium, but also a meticulously balanced blend of 13 essential macro and trace elements, crucial for the health and growth of your corals. Each of the elements plays a critical role in creating a stable and thriving environment for your reef.



IMPLEMENTING THE H2P™ SYSTEM

In the implementation section of the manual, we will guide you through the essential steps to effectively start and manage the H2P™ system in your aquarium. From initial setup to advanced dosing strategies, you will learn how to harness the full potential of the system to maintain optimal water chemistry and ensure the health and vitality of your reef ecosystem.

In Addition, we will discuss the recommended levels for macro and trace elements, the importance of extra supplementation, the correct procedures for water changes and utilising the D-D KH Manager for precise mutual control of alkalinity and pH. Finally, we will touch on professional laboratory testing, including an ICP testing schedule, to ensure the aquarium remains in perfect balance.

By following this comprehensive guide, you will be well-equipped to implement the H2P™ Dosing System effectively to achieve a thriving and vibrant reef aquarium.

How to start dosing the H2P™ Dosing system

Step 1 – Determine the alkalinity consumption of the tank

This can be done by testing alkalinity, then stopping all dosing and testing alkalinity again exactly 24 hours later. The difference between the alkalinity levels will be the consumption in 24 hours.

For example, if your first test reads 7.0 dKH, and your second test performed exactly 24 hours later reads 6.7 dKH, your daily consumption would be 0.3 dKH.

Step 2 – Setting the Part 1 dosing level

With the alkalinity consumption determined, the daily Part 1 volume, (Complete, pHplus or a mix of the two), can then be calculated by assuming that for every 10 mL of Part 1 solution you will increase the alkalinity of 100 litres of water by 1dKH.



Adjusting pH at the desired alkalinity level:

- If pH is not monitored, please use Complete as the sole component of Part 1
- If pH is monitored, you can dose Complete and pHplus at different times of the day to adjust pH towards to the level you desire:
 - **To raise pH: Increase the proportion of pHplus.**
 - **To lower pH: Decrease the proportion of pHplus.**

An alternatively way to dose is to mix Complete and pHplus to any ratio or either Complete or pHplus on their own.

Make adjustments gradually and monitor the changes.

Step 3 – Dosing the Part 1 solution

As good practice, place the dosing containers in a stable and safe place to avoid any spills into the water, i.e. avoid placing them directly on top of the sump or tank.

Dose the solutions into a very high flow/turbulent water area or alternatively directly into the return pump. Do not submerge the dosing lines and ensure they aren't exposed to any splashes. If you do not have a high flow area in the sump this can be achieved by placing a small pump near the exit of the dosing lines.

Ensure that after dosing, Part 1 it completely dissolves. If your Part 1 solution is not quickly dispersed in high flow, it is possible that it will settle at the bottom of the sump as a white calcium carbonate "mass" and will not work as intended. This happens because localised supersaturation promotes the calcium carbonate to precipitate rather than dissolve.

It is also important to note that to reduce the likelihood of precipitation, that the levels of pH, alkalinity, calcium, magnesium, PO_4 , temperature, etc. are kept within the recommended ranges detailed later. This applies whether using bicarbonate, carbonate or hydroxide to increase alkalinity.



Step 4 - Setting the Part 2 dosing level

If you know your daily calcium consumption you can start dosing, based on the assumption that 10 mL of Universal will increase the calcium level by 7.2 mg/L in 100L of water.

Alternatively, if you don't know the calcium consumption, but your tank alkalinity is within the range of 6.5-7.5dKH and your Calcium is lower than 420 ppm, then you can start dosing equal parts of Part 1 and Universal Part 2 based on the Part 1 daily volume determined earlier.

These volumes should be divided into as many small doses as possible and added equally throughout the day (ideally at least one dose of each part per hour).

Notes:

- Part 1 and Universal Part 2 should always be dosed at least 15 minutes apart to avoid chemical interference.
- If your tank alkalinity is above 8 dKH, stop the dosing of any alkalinity solutions and allow the alkalinity to drop to a value between 6.5-7.5 dKH. Similarly, if your tank's calcium is above 420 ppm, stop all calcium addition until the calcium drops to a value between 400-420 ppm.
- If your calcium is above 420 ppm you should not begin dosing Universal Part 2 until your calcium level is below the recommended value of 420ppm. However, you can dose Part 1 to maintain alkalinity as required.
- If any of your macro elements, such as calcium or magnesium are low, then please use the individual elements available in the range to adjust them to the recommended levels as detailed in the list further on. Do not attempt to use either of the 2 parts to increase individual elements as Reef Zlements H2P™ dosing system was not formulated for this purpose, and doing so will result in the likely overdose of other elements.



Step 5 – Regular testing

Test alkalinity/pH daily and calcium every 3-4 days for the first 2-3 weeks. We generally recommend continuous and consistent testing, as over the years we have noticed that the most successful reefers are those who keep a strong testing regime.

Do not allow alkalinity or calcium to increase or decrease during this time. If necessary to keep alkalinity and/or calcium stable, adjust Part 1 and/or Universal Part 2 dosing volumes independently.

Test salinity weekly and ensure salinity is kept within the recommended levels that you can find below. Please note that high salinity will quickly lead to coral losses.

We recommend that you periodically check the aquarium's water quality using our latest laboratory ICP OES DSOI analysis machine. Testing at least every four weeks when using the Reef Zlements 2 Part dosing system will give you the insight and recommendations you need to keep the aquarium in top condition.



WHAT PARAMETER LEVELS TO MAINTAIN?

It would not be far from the truth if one said that maintaining natural seawater elemental concentrations would be a good baseline for maintaining our aquariums, however, there might be some advantages in maintaining different levels from what is found in oceanic waters, mainly because an aquarium is, we can say, somewhat different from the oceans and the reefs.

With this in mind, for many parameters, we recommend levels close to natural seawater levels, for others, we recommend slightly different levels. This is based on our experience and observations, which, although they have a scientific basis, are mostly based on our empirical observations and experiments.

General Parameters

- Temperature – 24°C and within 23°C and 28°C
- Salinity – 34 ppt and within 33.5-35 ppt
- Alkalinity – 7 dKH and within 6.5-7.5 dKH
- pH – 8.2-8.3 and not lower than 8.15 or higher than 8.4

Macro and Micro elements

- Boron – 6 mg/L and within 4-10 mg/L
- Bromine – 75 mg/L and within 60-100 mg/L
- Calcium – 420 mg/L and within 380-480 mg/L
- Chloride – 18500 mg/L and within 18150-19500 mg/L
- Fluoride – 1.5 mg/L and within 1-1.9 mg/L
- Magnesium – 1400 mg/L and within 1300-1440 mg/L
- Potassium – 420 mg/L and within 400-430 mg/L
- Sodium – 10500 mg/L and within 10200-11000 mg/L
- Strontium – 10 mg/L and within 8-12 mg/L
- Sulphate – 2695 mg/L and within 2427-2964 mg/L
- Sulphur – 900 mg/L and within 810-990 mg/L



Trace elements

- Barium – 15 µg/L and within 10-100 µg/L
- Chromium - 0.5 µg/L and within 0.1-1 µg/L
- Cobalt - 0.2 µg/L and within 0.1-1 µg/L
- Copper - 0.2 µg/L and within 0.1-1 µg/L
- Iodine - 60 µg/L and within 60-95 µg/L
- Iron - 0.4 µg/L and within 0.2-5 µg/L
- Lithium – 200 µg/L and within 180-500 µg/L
- Manganese – 2 µg/L and within 0.9-4 µg/L
- Molybdenum - 15 µg/L and within 15-20 µg/L
- Nickel - 2.5 µg/L and within 2-5 µg/L
- Rubidium – 200 µg/L and within 150-500 µg/L
- Selenium - 0.2 µg/L and within 0.1-0.5 µg/L
- Silicon – 150 µg/L and below 300 µg/L
- Tin – 0 µg/L and below 10 µg/L
- Vanadium - 2 µg/L and within 0.5-5 µg/L
- Zinc – 5 µg/L and within 3-12 µg/L

Nutrient levels for SPS dominated:

- Nitrates – 5 mg/L and within 4-25 mg/L
- Orthophosphate – 50 µg/L and within 40-80 µg/L

Nutrient levels for LPS dominated:

- Nitrates – 15 mg/L and within 5-50 mg/L
- Orthophosphate – 80 µg/L and within 50-120 µg/L

Nutrient levels for Mixed reef:

- Nitrates – 10 mg/L and within 5-50 mg/L
- Orthophosphate – 60 µg/L and within 40-100 µg/L

With the above recommendations for temperature, pH, alkalinity and calcium, we would also like to note that although higher pH, alkalinity and calcium levels would accelerate coral growth, the recommended levels balance the benefits of coral growth against the supersaturation of the water with calcium carbonate and subsequent precipitation.



MACRO AND TRACE ELEMENTS SUPPLEMENTATION

Do I need additional trace elements?

To ensure a thriving aquarium, including healthy corals, maintaining stable environmental parameters is essential. This includes keeping alkalinity, pH, temperature, macro elements, and trace elements in check. While macro elements generally remain stable in seawater, trace elements are prone to rapid precipitation due to their chemical properties, concentrations, and seawater conditions.

The H2P™ Dosing System simplifies the process of meeting the macro elemental needs of corals. However, there may be occasional needs to adjust specific elements. For instance, when coralline algae proliferate, there is typically a higher demand for magnesium, necessitating supplementation.

These exceptions are why Reef Zlements provides individual macro elements for such corrections, ensuring targeted adjustments when needed. It is important to note, however, that this is not a daily occurrence.

The scenario is different for trace elements. Although the RZ H2P™ system supplies all required trace elements, these elements have significantly shorter residency times, i.e. a shorter life of those elements in solution in seawater compared to macro elements. As such, it may be beneficial to supplement a continuous supply of trace elements in small but more frequent doses, over and above the main dosing system.

How to dose the extra elements

Given the main requirement for trace addition, is the short residency time of some elements in the aquarium saltwater, the strategy should be to dose these traces as regularly as possible and in the smallest doses as possible to ensure we are keeping them in the most stable concentrations as possible.

However, we should not dose these traces without testing and monitoring due to the risk of overdosing, or in fact not dosing enough. As such, regular



ICP testing is required to administer adequate volumes of these elements (more on ICP testing below).

Reef Zlements only offers individual trace elements solutions as part of the H2P™ Dosing System. The reason is linked to the fact that an off-the-shelf general multi-element solution can easily overdose certain traces if one or more of the elements in those solutions are already elevated in the tank.

However, it is not necessary to dose single element solutions one at a time, instead you can make up two bespoke solutions for your aquarium based on each individual ICP testing results.

To facilitate this, Reef Zlements has created 2 categories for its elements to indicate which of the elements can be mixed together and those that cannot.

- **Type A Solutions:** Indicates Anions
- **Type C Solutions:** Indicates Cations

Type A solutions can be mixed together, and Type C solutions can be mixed together, but not A and C.

So, with this categorisation, we can simply add similarly charged elements to one of the solutions and the opposite charged ones to the other.

But what are the Reef Zlements Type A and C elements? This is a fairly simple question to answer and the following elements can be mixed together:

Type A

- Iodine
- Molybdenum
- Selenium
- Sulphur/Sulphate
- Vanadium

Note that although Sulphur is a macro element, it has been added to the list due to the need to be dosed slowly to avoid bacterial problems which can cause STN and RTN in corals.



Type C

- Barium
- Cobalt
- Chromium
- Iron
- Copper
- Manganese
- Nickel
- Rubidium
- Zinc

Now that we know which trace elements can be mixed together, the next step is to add them in the correct amounts and perform a dilution which allows us to dose these traces hourly, in between Part 1 and Part 2 dosing of the H2P™.

E.g. On the hour Part 1, quarter past the hour Trace A, half past the hour Part 2, quarter to the hour Trace C, ensuring that every 15 minutes elements are being dosed into the aquarium.

This is a very easy step. You only need to use the ICP results and mixing suggestions to create these custom solutions (this feature is being developed and will be available on the website soon). In the meantime, if you are using our H2P™ Dosing method you can contact us for help with the mixes.

Once these two mixes have been created, you should dose 1 mL of each solution (Type A and C) per hour, continuously.

As an important note, we recommend that you make up the two solutions to last no longer than the ICP routine schedule to ensure ideal dosing amounts and avoid any overdosing.



Nutrient Supplementation

Regarding nutrient supplementation, we recommend having a conservative approach and only dose the different nutrients, when necessary, i.e. if both nitrate and phosphate are low, we recommend that you initially bring the concentration of these up to ideal levels by adding both NitroPlus and PhosPlus before changing over to dosing CarboPlus, AminoPlus and VitaPlus in as small amounts as possible which will maintain both nitrate and phosphate.

This will provide the organic nutrients corals and other microorganisms need, whilst minimising their availability in the water column, which can lead to potential bacterial and pollution issues.

Ensuring adequate nutrient levels is crucial to maintain healthy and growing corals.



WATER CHANGES

We see water changes as a tool to remove unwanted compounds or elements that have increased to undesired levels. These water changes are sometimes necessary as specific pollutants cannot be removed by other means, or they are in a context where the easiest way to remove them is actually to perform a series of water changes; the most common example we see is Tin.

When using the Reef Zlements H2P™ system, water changes, with the exception of the above are not required, not only because water changes are not as effective as the H2P™ system at maintaining elemental levels, but because water changes can be a major destabilising factor, and as such do not support the stability that corals need.

The above, however, is only possible with the implementation of the H2P™ methodology, combined with a strong testing and monitoring regime and a close maintenance routine. These components in a successful aquarium provide parameter stability and high-water quality which is essential to keep healthy corals.

With the above said, given dissolved organic compounds (DOC), can still accumulate despite a strong filtration, we recommend that you perform a series of 3-4 large water changes (i.e. 30%) weekly for a month once year. This should ideally be performed during the spring when pollen in the air is at its higher levels. This will ensure that unhealthy dissolved organic levels in the aquarium remain low and pathogens aren't allowed to proliferate as easily.

During such water changes we strongly recommend taking the opportunity to syphon the substrate (if there is one) and make sure that any detritus or waste that may have accumulated are removed. It is important to make sure that none of the dirt that is being removed from the substrate flows freely into the water column to avoid any issues.

By maintaining a wise approach to water changes and your reef keeping methodology, it is possible to keep a balance between “semi” no water changes and a healthy environment.



PROFESSIONAL LABORATORY TESTING

Maintaining a reef aquarium requires precise monitoring and management of water chemistry to ensure the health and growth of corals and other marine life. At Reef Zlements, we like to say that **'we don't keep corals; we keep the water'**.

While hobbyists can test for basic parameters like pH, alkalinity, and nitrate at home, testing for most macro and trace elements, such as strontium, potassium, iodine, zinc, and others, presents significant challenges with home test kits being extremely inaccurate.

Many trace elements, including iodine, iron, and manganese, are essential for coral, algae, and bacterial health but are difficult or impossible to monitor using conventional home test kits. Testing for these macro and trace elements and other key parameters often requires advanced analytical techniques such as Inductively Coupled Plasma (ICP), Ion Chromatography (IC), and Titrations with higher accuracy than what home test kits offer.

These methods are complex and require specialised equipment and technical expertise, which are not typically available to home aquarium hobbyists.

ICP Testing

ICP testing is an analytical method that allows measurement of the chemical composition of water. It can measure a wide range of elements, including both macro and trace elements with high accuracy. This comprehensive analysis tool helps identify any deficiencies or excesses that can affect the health of the reef ecosystem. Alongside ICP testing, IC testing allows laboratories to measure other ions like nitrate, orthophosphate, fluoride, and sulphate, amongst others, whilst automated or robotic titration can measure parameters such as alkalinity, pH, and conductivity.

By combining different analytical techniques, laboratories can offer comprehensive testing, as offered by the Reef Zlements Advanced Test.



The detailed results from such tests provide valuable insights for adjusting dosing regimens. By knowing the exact concentrations of essential elements, reef keepers can fine-tune their supplementation, ensuring that corals receive the nutrients they need without over-dosing or under-dosing.

Regular ICP testing helps to maintain the long-term stability of the reef aquarium. By consistently monitoring and adjusting water chemistry based on precise data, reef keepers can avoid drastic fluctuations that can stress or harm corals and other marine life. Properly balanced water chemistry achieved through the insights provided by ICP testing, supports optimal coral growth and vibrant coloration. Healthy corals are more resilient to diseases, parasites and environmental stressors.

ICP Testing schedule

Before starting to use the H2P™ dosing system, we recommend performing a Reef Zlements Advanced ICP Test. This will provide a baseline and allow you to take any corrective actions to ensure that the H2P™ system is implemented successfully.

After the start of the H2P™ dosing and once all macro elements and Iodine being corrected, we recommend a second ICP to be sent 2 weeks later, this will serve to determine a daily Iodine, Molybdenum and other trace element maintenance dose. After which we recommend performing a routine ICP at least every 4-6 weeks.

This routine ICP test will allow for minor corrections and to address any issues that may arise (e.g. accidental overdosing, unknown introduction of certain trace elements in the tank via unknown sources, etc.). Over time, this routine will allow to fully understand the aquarium's specific consumption and avert any unexpected issues.



THE D-D KH MANAGER

Whilst the H2P™ dosing system can be successfully implemented using manual dosing schedules and a standalone pump like the D-D P4 Pro dosing pump, an exciting new tool that will revolutionise aquarium dosing automation is soon to be available.

In partnership with D-D The Aquarium Solution, Kamoer, and Reef Zlements, a new functionality for the D-D KH Manager has been developed, taking this app-controlled device to the next level. The KH Manager not only samples and tests your tank water for KH, maintaining alkalinity levels automatically, but now also offers advanced dosing control to allow you to control your pH.

Most hobbyists are continually chasing the tail of low pH, but by using pHplus as your 'Part 1' solution, you can gradually increase the average pH of your system to an optimum level of 8.2-8.3, which is the ideal range to achieve the best coral growth and health. Once you get to that point you can then use Complete to maintain the elevated level and cycle back to pHplus if the pH starts to gradually fall.

By using a KH Manager, with the new programming, the switch from pHplus to Complete can now be fully automated about a user defined set point, using the pH measurement that the unit already takes when carrying out the normal KH test and adjustment, to maintain a constant elevated 'Average pH'. The additional benefit of this automation is that it can also reduce the normal day to night pH swing that occurs on all aquariums.

Natural diurnal biological activity within the aquarium will act every day to raise and reduce the pH of your system. Photosynthesis within the corals during the day, whilst the lights are on, will raise your pH, and respiration at night, will lower the pH. On most aquariums this daily swing of pH will be between 0.2 and 0.3, depending on stocking and degassing effectiveness of the system.

Using the KH Manager, the programme will enable you to dose Complete during the day whilst the pH in the aquarium is naturally rising, and to dose



pHplus at night to counteract the natural fall. This will give you the ability to potentially halve the daily pH swing on your system so that it spends more time in the ideal range.

If you allow the KH Manager to maintain the alkalinity and pH levels, there are some interesting safeguard measures. For example, to prevent the KH Manager from overdosing KH Buffer, the user can set a physical limit to the volume to be dosed. If you don't want the KH Manager to dose more than 10 mL of KH Buffer autonomously, even if it determines that 20 mL is needed to reach the target alkalinity level, it will only dose 10 mL.

Additionally, it can be set to send alerts about abnormal testing results (outside the set range for both KH and pH). It is also possible to set an auto re-test if the alkalinity test provides an abnormal result. These features give the user confidence that the aquarium is safe.

This technology means that, for the first time, reefers can manage and maintain stable levels of both alkalinity and pH in real-time, ensuring a perfectly balanced and healthy aquarium environment.



CONCLUSION

The new Reef Zlements H2P™ dosing system signifies a remarkable advancement in aquarium care, providing unparalleled precision and automation. By combining chemicals that have been formulated based on scientifically proven knowledge and research with robust professional testing and innovative technology, it simplifies the complex task of maintaining optimal water chemistry, which is essential to achieving an amazing reef aquarium. The seamless integration of the D-D KH Manager and the H2P™ system ensures a stable, healthy, and thriving aquarium environment.

Whether you are an experienced reefer or new to the hobby, this innovative system empowers you to effortlessly achieve and maintain ideal alkalinity, pH, and elemental levels.

We trust this quick guide along our professional testing laboratory provides you with the necessary guidance to effectively utilise the H2P™ dosing system to its full capabilities. By following the outlined procedures and recommendations, you can ensure the longevity and success of your reef aquarium. Embrace this innovative solution and enjoy the benefits of a meticulously balanced and vibrant aquarium. Nonetheless, if you are interested in knowing more about the chemistry, biochemistry and science behind the H2P™ method we encourage you to read “The comprehensive user manual for the H2P™ dosing system”, but in the meantime we wish you all the best.

On behalf of the whole RZ team, we thank you for choosing Reef Zlements,

Jose

Reef Zlements CEO



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