

# Using and Programming dosing using the KH Manager connected to a P4/P4PRO dosing pump

The E1 Connection box allows one or two D-D P4/P4 PRO dosing pumps to be linked with the KH Manager. Connection to the D-D P4 and P4 PRO pumps allows automatic adjustments to be made to the programmed schedule of one or more of the dosing pump heads after each KH test. This avoids the gradual over or under dosing issues commonly found when repeatedly dosing a set amount due to various environmental factors fluctuating the uptake of elements or simply from the difficulty of getting the dosing 100% accurate for the aquariums needs.

Any dosing heads on the P4 or P4 PRO pumps that you do not want to be automatically adjusted can be set to run an independent dosing schedule as normal with no adjustments from the KH Manager.

This control can also allow multi part dosing systems to be adjusted by the KH Manager such as Reef Zlements 2 part systems or the dosing of other elements such as Calcium and Magnesium to be increased or decreased with the KH usage of your aquarium.

**Only Cloud versions of the D-D P4 Pump(s) using the Kamoer Remote App can be linked to the KH Manager. Both the KH Manager and the D-D P4 dosing pump(s) will need to be connected through a router to the same cloud account for the control function to be used.**

When setting up this method it is important to remember that the aim is not for the dosing to be completely controlled by the KH Manager but the unit to be used as a way of maintaining long term stability in the aquarium and to prevent the gradual increase or decrease in levels commonly found when dosing traditionally, whether that be from the increased uptake of the aquarium as the corals grow or from fluctuations that can occur due to changes in metabolic rates. A dosing program (baseline) still needs to be set on the P4 pump that approximately fulfils the needs of the aquarium, the KH Manager will then automatically fine tune dosing as a result of the KH testing and what is needed by the aquarium.

The examples below give some basic settings that can be used as a starting point, please be aware that the baseline dosing program on the P4 should be adjusted if the test results are indicating a constant trend for the results to be high or low from the desired levels.

In the examples information is given for;

**Baseline settings for the P4/P4PRO** – These are your expected daily dosing amounts and should be determined by your tanks uptake and the additive manufactures recommended dosing for your aquarium.

**KH Manager Dosing Pump setting** – The dosing pump built on to the KH Manager can be left active to dose as a result of each automatic KH test, be turned off completely or set to a custom dosing schedule that is independent of the testing.

**Testing frequency of the KH Manager** – The KH Manager can be set to test 24 times a day but care must be taken that there is enough time between tests for any adjustments to be made to the P4 dosing. Any dosing adjustments will only be active on dosing that falls between tests. It is suggested that 4-6 tests are done a day, this is enough to keep the aquarium stable and give enough time between test for effective dosing.

**KH Manager set point** – This is your desired target KH level in your aquarium.

**KH Manager Adjustment Settings** – These let the KH Manager know how much it can affect the dosing on the P4, it can be set to make a big difference increasing or decreasing the amount actually dosed or no difference at all if it is on a pump head that you do not want to change as a result of the KH test.

**Range** – This determines the range that the dosing will be affected. It can be set to a maximum of 1dKH either side of your set point, outside this range the P4/P4PRO will just follow its set baseline program and no adjustments will be made. You can set this at 0.1dKH increments above and below the set point.

**Method** - Sets the adjustment limits that the KH Manager can use for its calculation after each test so it can work out how much less or extra it can tell the P4/P4 Pro to dose with its next baseline addition.

- Can be set as an amount in ml, we would suggest this amount is about 10-15% of your total P4/P4PRO baseline for the dosing head i.e. if you are adding 30ml of Reef Zlements part 1 you would set this between 3ml and 4.5ml for that pump head.

Or

- Can be set as a percentage, this method is best suited to situations where large single additive additions are being made instead of dosing that is split throughout the day and should be set around 50% as a guide.

**Adjust times** - This is how many of the P4/P4PRO baseline additions will be changed. It is important to remember that this should be set to no more than the number of doses between each test to take full advantage of your adjustment settings.

**Worked Examples** - This gives information how the KH Manager will react based on the example settings given.

## EXAMPLE SETUP ONE

Using the KH Manager connected to a P4PRO with the E1 Box - Dosing Reef Zlements Complete Part 1 and Part 2(or PH Plus), Vita Plus and Amino Plus on a 300L well stocked mixed reef tank.

### BASELINE SETTINGS FOR THE P4/P4PRO

Set a plan for each pump head 0:00-23:59 and then use the 'Quick Add' function to set up the dosing below. **Any dosing must be downstream of where the KH Manager takes its sample from to avoid false test results.**

**P4 Pump Head 1 – REEF ZLEMENTS PART 1** – Set to dose 29ml per day split over 24 doses with the chemical interference set to 0 minutes.

**P4 Pump Head 2 – REEF ZLEMENTS PART 2** – Set to dose 29ml per day split over 24 doses with the chemical interference set to 30 minutes as you do not want it dosing at the same times as Part 1.

**P4 Pump Head 3 – REEF ZLEMENTS VITA PLUS** – Set to dose 9ml per day split over 24 doses with the chemical interference set to 10 minutes so dosing is not the same times as the other pump heads.

**P4 Pump Head 4 – REEF ZLEMENTS AMINO PLUS** – Set to dose 6ml per day split over 24 doses with the chemical interference set to 15 minutes so dosing is not the same times as the other pump heads.

Set this on your P4/P4PRO as if you are setting up a dosing pump as normal based on how much you think your tank needs.

### KH MANAGER DOSING PUMP SETTING

Dosing pump on KH Manger not used (Turn KH Manager dosing off in 'Add KH Settings')

**Top tip;** although this pump is not being used for this example it does not make it useless, in the KH Manager settings you can still use this pump as a standard single channel dosing pump, set the pump to custom mode, leave the adjustment method off and use it to dose something like Reef Zlements Blizzard, or if you want to have the dosing effected by the KH test results set the adjust KH Settings.

In this example Part 1 and Part 2 Reef Zlements are being dosed on the P4/P4PRO so this is not being used and should be turned off.

### TESTING FREQUENCY OF THE KH MANAGER

Set the KH Manager to test 6 times a day.

Test times - 00:00  
04:00  
08:00  
14:00  
16:00  
20:00

The gap between the tests is big enough that the P4 will be able to dose each channel 3 times between tests. If the test frequency is too often there is not enough time for the P4 to dose

### KH MANAGER SET POINT

In the 'Keep KH' settings set the 'Keep KH balance value' to 7.5dKH.

This is the target value that the KH Manager will aim to maintain.

## KH MANAGER ADJUSTMENT SETTINGS

In the pages for the KH Manager go to the 'Keep KH' settings and then to the adjustment settings for the P4/P4PRO pump you have connected.

P4/P4PRO pump heads 1 and 2 are dosing the Reef Zlements Part 1 and Part 2, these should have the same adjustment setting so they dose in balance.

### Set P4/P4PRO Pump heads 1 and 2 adjustment settings to;

**RANGE** 7-8 - If the KH test result is between 7 and 8 the KH Manager will make adjustments to the dosing, outside of this range the dosing will be done as the baseline settings.

**METHOD** 4.3ml per 1dKH - This is about 15% of the normal baseline dose of 28ml. Can be set higher but remember the aim is to make small adjustments to keep stability not make sudden corrections.

**ADJUST TIMES** 3 - This is set to match the number of baseline doses between each test.

### Set P4/P4PRO Pump head 3 adjustment settings to;

**RANGE** 7-8 - If the KH test result is between 7 and 8 the KH Manager will make adjustments to the dosing outside of this range the dosing will be done as the baseline settings.

**METHOD** 1.3ml per 1dKH - This is about 15% of the normal baseline dose of 9ml.

**ADJUST TIMES** 0 - Setting the adjust times to zero will mean that the KH Manager will **not** make any adjustments to the baseline dosing on this pump head.

### Set P4/P4PRO Pump head 4 adjustment settings to;

**RANGE** 7-8 - If the KH test result is between 7 and 8 the KH Manager will make adjustments to the dosing outside of this range the dosing will be done as the baseline settings.

**METHOD** 0.9ml per 1dKH - This is about 15% of the normal baseline dose of 6ml.

**ADJUST TIMES** 0 - Setting the adjust times to zero will mean that the KH Manager will **not** make any adjustments to the baseline dosing on this pump head.

This prevents extreme over or under dosing if there is an issue during a test or with a test result.

Can be set higher but remember the aim is to make small adjustments to keep stability not make sudden corrections.

Any adjustments are spread over as many baseline doses as possible to avoid sudden changes.

## WORKED EXAMPLE

After each test the KH Manager will make the following automatic calculation

$$\frac{(\text{KH Manager set point} - \text{KH Test result}) \times \text{Method amount}}{\text{Adjust Times}}$$

This will then be added to the baseline dose set on the P4 pump. After each test this will be calculated again.

Based on the settings in this example if the KH Manager performed a test and the KH reading was low at 7.2 dKH then the following would happen on the next baseline doses on the P4 pump.

### P4 Pump Head 1 – REEF ZLEMENTS PART 1

Instead of dosing 1.2ml, as set for the next 3 baseline doses, the P4 would be instructed to increase the amount to 1.63ml to help gradually raise the KH back to the desired level of 7.5dKH.

$(7.5\text{dKH} - 7.2\text{dKH}) \times 4.3\text{ml} = 1.29\text{ml}$  This is then divided by the 3 (the number of adjust times) and added to the baseline dose of 1.2ml, resulting of a dose of 1.63ml.

After a test the KH Manager will not immediately cause the P4 dosing pump to run. It will send an instruction signal to the P4 to tell it how much it needs to change its next dose(s) on each pump head.

#### **P4 Pump Head 2 – REEF ZLEMENTS PART 2**

Instead of dosing 1.2ml, as set for the next 3 baseline doses, the P4 would be instructed to increase the amount to 1.63ml to match the dosing set for Reef Zlements Part 1.

$(7.5\text{dKH} - 7.2\text{dKH}) \times 4.3\text{ml} = 1.29\text{ml}$  This is then divided by the 3 (the number of adjust times) and added to the baseline dose of 1.2ml, resulting of a dose of 1.63ml.

#### **P4 Pump Head 3 – REEF ZLEMENTS VITA PLUS**

On this pump head we have set the number of adjust times to zero so the P4 will dose 0.38ml as set for the baseline dosing

#### **P4 Pump Head 4 – REEF ZLEMENTS AMINO PLUS**

On this pump head we have set the number of adjust times to zero so the P4 will dose 0.25ml as set for the baseline dosing

Based on the settings in this example if the KH Manager performed a test and the KH reading was high at 7.7 dKH then the following would happen to the next baseline doses on the P4 pump.

#### **P4 Pump Head 1 – REEF ZLEMENTS PART 1**

Instead of dosing 1.2ml, as set for the next 3 baseline doses, the P4 would be instructed to reduce the amount to 0.91ml to help gradually allow the KH to lower back to the desired level of 7.5dKH.

$(7.5\text{dKH} - 7.7\text{dKH}) \times 4.3\text{ml} = -0.86\text{ml}$  This is then divided by the 3 (the number of adjust times) and added to the baseline dose of 1.2ml, resulting of a dose of 0.91ml.

#### **P4 Pump Head 2 – REEF ZLEMENTS PART 2**

Instead of dosing 1.2ml, as set for the next 3 baseline doses, the P4 would be instructed to reduce the amount to 0.91 ml to match the dosing set for Reef Zlements Part 1.

$(7.5\text{dKH} - 7.7\text{dKH}) \times 4.3\text{ml} = -0.86\text{ml}$  This is then divided by the 3 (the number of adjust times) and added to the baseline dose of 1.2ml, resulting of a dose of 0.91ml.

#### **P4 Pump Head 3 – REEF ZLEMENTS VITA PLUS**

On this pump head we have set the number of adjust times to zero so the P4 will be told to dose 0.38ml as set for the baseline dosing

#### **P4 Pump Head 4 – REEF ZLEMENTS AMINO PLUS**

On this pump head we have set the number of adjust times to zero so the P4 will be told to dose 0.25ml as set for the baseline dosing

## EXAMPLE SETUP TWO

Using the KH Manager connected to a P4PRO with the E1 Box - Dosing Reef Zlements KH Buffer, Calcium, Magnesium, Strontium and Iodine on a 300L well stocked mixed reef tank.

### BASELINE SETTINGS FOR THE P4/P4PRO

Set a plan for each pump head 0:00-23:59 and then use the 'Quick Add' function to set up the dosing below. **Any dosing must be downstream of where the KH Manager takes its sample from to avoid false test results.**

**P4 Pump Head 1 – REEF ZLEMENTS CALCIUM**– Set to dose 27ml per day split over 24 doses with the chemical interference set to 0 minutes.

**P4 Pump Head 2 – REEF ZLEMENTS MAGNESIUM**– Set to dose 9ml per day split over 24 doses with the chemical interference set to 15 minutes.

**P4 Pump Head 3 – REEF ZLEMENTS STRONTIUM** – Set to dose 6ml per day split over 12 doses with the chemical interference set to 30 minutes.

**P4 Pump Head 4 – REEF ZLEMENTS IODINE** – Set to dose 1ml per day split over 4 doses with the chemical interference set to 45 minutes.

Set this on your P4/P4PRO as if you are setting up a dosing pump as normal, based on how much you think your tank needs.

### KH MANAGER DOSING PUMP SETTING

Dosing pump on KH Manager set to 'Auto Add'.

**'Total Add Cap'** set to 7.5ml - This limits how much KH buffer can be added after each test and should be set to an amount that will not allow the KH to rise more than 0.5dKH after normal usage per day.

**'Single Add Cap'** set to 0.5ml - This breaks down how much KH buffer can be added in one dose, e.g. if the KH manager needs to dose 2ml after a test and this is set to 0.5 it will perform 4 doses of 0.5ml.

**'KH Interval'** set to 15 minutes - This is how much time is left between each 'Single Add Cap' dose. Set this so that there is enough time to dose the 'Total Add Cap' between tests, and ideally so the dosing is finished at least 45 minutes before the next test to allow the KH buffer to disperse in to the aquarium.

**'KH Reagent Rise Brand'** set to 'Other' and 10ml to raise dKH by 1 in 100L of water as shown on the Reef Zlements KH Buffer instructions.

After each test the KH Manager will add the calculated amount of KH Buffer to increase your KH to the target value.

### TESTING FREQUENCY OF THE KH MANAGER

Set the KH Manager to test 4 times a day.

Test times - 00:00  
06:00  
12:00  
18:00

The gap between the tests is big enough that the P4 will be able to dose between tests. If the test frequency is too often there is not enough time for the P4 to dose

### KH MANAGER SET POINT

In the 'Keep KH' settings set the 'Keep KH balance value' to 7.5dKH.

This is the target value that the KH Manager will aim to maintain.

## KH MANAGER ADJUSTMENT SETTINGS

In the pages for the KH Manager go to the 'Keep KH' settings and then to the adjustment settings for the P4/P4PRO pump you have connected.

### Set P4/P4PRO Pump head 1 adjustment settings to;

**RANGE** 7-8 - If the KH test result is between 7 and 8 the KH Manager will make adjustments to the dosing outside of this range the dosing will be done as the baseline settings.

**METHOD** 4ml per 1dKH - This is about 15% of the normal baseline dose of 27ml. Can be set higher but remember the aim is to make small adjustments to keep stability not make sudden corrections.

**ADJUST TIMES** 5 - This is set to match the number of baseline doses between each test.

### Set P4/P4PRO Pump head 2 adjustment settings to;

**RANGE** 7-8 - If the KH test result is between 7 and 8 the KH Manager will make adjustments to the dosing outside of this range the dosing will be done as the baseline settings.

**METHOD** 1.3ml per 1dKH - This is about 15% of the normal baseline dose of 9ml.

**ADJUST TIMES** 5 - This is set to match the number of baseline doses between each test.

### Set P4/P4PRO Pump head 3 adjustment settings to;

**RANGE** 7-8 - If the KH test result is between 7 and 8 the KH Manager will make adjustments to the dosing outside of this range the dosing will be done as the baseline settings.

**METHOD** 0.9ml per 1dKH - This is about 15% of the normal baseline dose of 6ml.

**ADJUST TIMES** 2 - This is set to match the number of baseline doses between each test.

### Set P4/P4PRO Pump head 4 adjustment settings to;

**RANGE** 7-8 - If the KH test result is between 7 and 8 the KH Manager will make adjustments to the dosing outside of this range the dosing will be done as the baseline settings.

**METHOD** 0.1ml per 1dKH - This is about 15% of the normal baseline dose of 1ml.

**ADJUST TIMES** 0 - Setting the adjust times to zero will mean that the KH Manager will **not** make any adjustments to the baseline dosing on this pump head.

This prevents extreme over or under dosing if there is an issue during a test or with a test result.

Can be set higher but remember the aim is to make small adjustments to keep stability not make sudden corrections.

Any adjustments are spread over as many baseline doses as possible to avoid sudden changes.

## WORKED EXAMPLE

After each test the KH Manager will make the following automatic calculation

$$\frac{(\text{KH Manager set point} - \text{KH Test result}) \times \text{Method amount}}{\text{Adjust Times}}$$

This will then be added to the baseline dose set on the P4 pump. After each test this will be calculated again.

After a test the KH Manager will not immediately cause the P4 dosing pump to run. It will send an instruction signal to the P4 to tell it how much it needs to change its next dose(s) on each pump head.

Based on the settings in this example if the KH Manager performed a test and the KH reading was low at 7.2 dKH then the following would happen on the next baseline doses on the P4 pump.

#### **P4 Pump Head 1 – REEF ZLEMENTS CALCIUM**

Instead of dosing 1.1ml, as set for the next 5 baseline doses, the P4 would be instructed to increase the amount to 1.34ml to help gradually raise the Calcium in line with the extra KH Buffer being added.

$(7.5\text{dKH} - 7.2\text{dKH}) \times 4\text{ml} = 1.2\text{ml}$  This is then divided by the 5 (the number of adjust times) and added to the baseline dose of 1.1ml, resulting of a dose of 1.34ml.

#### **P4 Pump Head 2 – REEF ZLEMENTS MAGNESIUM**

Instead of dosing 0.4ml, as set for the next 5 baseline doses, the P4 would be instructed to increase the amount to 0.48ml to help gradually raise the Magnesium in line with the extra KH Buffer being added.

$(7.5\text{dKH} - 7.2\text{dKH}) \times 1.3\text{ml} = 0.39\text{ml}$  This is then divided by the 5 (the number of adjust times) and added to the baseline dose of 0.4ml, resulting of a dose of 0.48ml.

#### **P4 Pump Head 3 – REEF ZLEMENTS STRONTIUM**

Instead of dosing 0.5ml, as set for the next 2 baseline doses, the P4 would be instructed to increase the amount to 0.64ml to help gradually raise the Strontium in line with the extra KH Buffer being added.

$(7.5\text{dKH} - 7.2\text{dKH}) \times 0.9\text{ml} = 0.27\text{ml}$  This is then divided by the 2 (the number of adjust times) and added to the baseline dose of 0.5ml, resulting of a dose of 0.64ml.

#### **P4 Pump Head 4 – REEF ZLEMENTS IODINE**

On this pump head we have set the number of adjust times to zero so the P4 will dose 0.25ml as set for the baseline dosing

#### **KH Manager Dosing Pump - REEF ZLEMENTS KH BUFFER**

As the dosing pump on the KH Manager is set to 'Auto Add' it will automatically calculate and add the amount of KH buffer needed to raise the tank from 7.2dKH to 7.5dKH.

Based on the settings in this example if the KH Manager performed a test and the KH reading was high at 7.7 dKH then the following would happen to the next baseline doses on the P4 pump.

#### **P4 Pump Head 1 – REEF ZLEMENTS CALCIUM**

Instead of dosing 1.1ml, as set for the next 5 baseline doses, the P4 would be instructed to reduce the amount to 0.94ml to decrease the amount of Calcium being added as less KH has been used.

$(7.5\text{dKH} - 7.7\text{dKH}) \times 4\text{ml} = -0.8\text{ml}$  This is then divided by the 5 (the number of adjust times) and added to the baseline dose of 1.1ml, resulting of a dose of 0.94ml.

#### **P4 Pump Head 2 – REEF ZLEMENTS MAGNESIUM**

Instead of dosing 0.4ml, as set for the next 5 baseline doses, the P4 would be instructed to reduce the amount to 0.35 ml to decrease the amount of Magnesium being added as less KH has been used.

$(7.5\text{dKH} - 7.7\text{dKH}) \times 1.3\text{ml} = -0.26\text{ml}$  This is then divided by the 5 (the number of adjust times) and added to the baseline dose of 0.4ml, resulting of a dose of 0.35ml.

#### **P4 Pump Head 3 – REEF ZLEMENTS STRONTIUM**

Instead of dosing 0.5ml, as set for the next 2 baseline doses, the P4 would be instructed to reduce the amount to 0.41 ml to decrease the amount of Strontium being added as less KH has been used.

$(7.5\text{dKH} - 7.7\text{dKH}) \times 0.9\text{ml} = -0.18\text{ml}$  This is then divided by the 2 (the number of adjust times) and added to the baseline dose of 0.5ml, resulting of a dose of 0.41ml.

#### **P4 Pump Head 4 – REEF ZLEMENTS IODINE**

On this pump head we have set the number of adjust times to zero so the P4 will dose 0.25ml as set for the baseline dosing.

#### **KH Manager Dosing Pump - REEF ZLEMENTS KH BUFFER**

As the dKH level is higher than the set point no KH Buffer will added.

Please note the above are designed as examples only and the actual usage of the aquarium should be taken into consideration when deciding on the baseline dosing set on the P4 unit, the amount that the KH Manager can adjust the KH by and the range that the adjustment will be active.