



## D-D MULTI TEST KIT CALCIUM / MAGNESIUM / KH

The D-D Multi Test Kit includes liquid tests for the three most commonly tested parameters by marine or reef aquarists, those of calcium, magnesium and alkalinity.

All three parameters have a natural balance relative to each other which should be maintained to provide a healthy environment within your reef aquarium.

Visit our website for further information on the correct balance of these 3 ions.

This test kit will allow you to monitor the levels of all three parameters that they may be maintained by way of water changes or scheduled dosing.

We Recommend the use of 'balanced' H2Ocean Pro+ salt.

REFILLS ARE AVAILABLE FOR THIS TEST KIT

### IMPORTANT:

This test kit contains 3 separate sets of reagents and it is vital that there is no contamination between the reagents from each test if accuracy is to be maintained.

**A - Rinse all test tubes, stopper/caps and syringes/tips in reverse osmosis or de-ionized water several times before and after use to eliminate contamination which will affect the accuracy of the test kit.**

Use of printed tissue or detergent on cleaning cloths to dry the vial will lead to contamination and a false positive reading. We recommend allowing to air dry.

**B - Cross use of syringes, or test vials can result in contamination during testing leading to false test results. To ensure ongoing accuracy long term use only the correct components for each part of the test.**

## CALCIUM (Ca) TEST KIT

### Calcium in the Aquarium

Maintaining the correct calcium (Ca) level is crucial for success in marine aquaria with regard to calcification in stony corals, clams, and some soft corals.

Insufficient calcium can lead to a reduction in growth rates which may cause stress to aquarium inhabitants.

Correct levels of Calcium should be maintained at all times in balance with Magnesium and Alkalinity.

Natural seawater has a calcium concentration of between 380-450ppm with an average of 420ppm

### Instructions for use.

READ IN COMBINATION WITH THE PICTOGRAPHIC INSTRUCTIONS ON EACH RELEVANT TEST CARD

**Step 1:** Using the large (6ml) syringe, add exactly 5ml of aquarium water to the test vial.

**Step 2:** Add 5 drops of calcium reagent A to the test vial, seal with the supplied stopper / cap and shake gently for several seconds. The solution will become cloudy indicating that the magnesium has precipitated out from the sample. Reseal reagent bottle A immediately after use.

**Step 3:** Uncap the vial and add 1 level measuring spoon of calcium reagent B. Reseal reagent B bottle immediately after use.

**Step 4:** Replace stopper / cap on test vial, and shake until all powder is dissolved.

**Step 5:** Uncap the test vial and let it stand for 20 seconds. The colour of the solution should now be pink.

**Step 6:** Push the CLEAR plastic tip firmly onto the end of the 1ml 'BLACK' syringe. Use this tip for the calcium only.

**IMPORTANT:** It is VITAL to use the BLACK syringe for the CALCIUM AND MAGNESIUM TESTS ONLY and to clean it out in RO water both before and after each use as although the two titration solutions contain the same reagent, they are both of different strengths and cross contamination will produce an error in results.

Always return the material to the correct bottle by ensuring that you only have one test kit out at a time.

**Step 7:** Fill with calcium reagent C until the bottom of the plunger seal is level with the 1ml line on the syringe, (see image on pictographic instructions).

There will always an air pocket near the plunger in the syringe which will not affect the result. Avoid drawing further air into the chamber as this may affect test accuracy. If bubbles are drawn into the syringe then return the liquid to the bottle and start again.

Replace the lid on reagent bottle C immediately after use.

**Step 8:** Hold the syringe in one hand and the test vial in the other. Add the calcium reagent C solution drop wise to the vial whilst swirling between each addition and looking through the SIDE against a white piece of paper.

It is possible to add the first 0.5 ml of the syringe relatively quickly as this relates to a calcium level of only 250ppm.

The solution in the vial will remain pink until close to the end point when you will see the surface change to blue where the drop enters and then turn back to pink.

Slow the addition rate right down at this stage and ensure that you swirl the vial strongly to fully mix each extra drop into the solution. The colour will start to turn dark pink and then purple until the one last drop removes any final hint of pink from the colour and produces a pure blue colour.

This is the end point of the titration at which point the colour should match the swatch on the instruction card.

**Step 9:** Read off the amount of calcium reagent C 'remaining' in the 1ml syringe and refer to the chart below to determine the calcium level in your sample. (any remaining reagent in the syringe can be returned back to the calcium reagent C bottle)

If after adding a full 1ml of calcium reagent C to the test vial there is still no change, then the calcium level is above 500ppm. Refill the syringe and continue to add further drops until the end point is reached.

Calculate the total volume added in ml and multiply by 500 to get the final calcium reading.

## Calcium Level Chart

Remaining Reagent in Syringe	Calcium Level in Sample	Balanced dKH Level to Achieve
0.35	325	-
0.30	350	-
0.28	360	-
0.26	370	-
0.24	380	-
0.22	390	-
0.20	400	5.50
0.18	410	6.90
0.16	420	8.25
0.14	430	9.62
0.12	440	11.15
0.10	450	-
0.08	460	-
0.06	470	-
0.04	480	-
0.02	490	-
0.00	500	-

## Magnesium Level Chart

Remaining Reagent in Syringe	Magnesium Level in Sample
0.55	900
0.50	1000
0.48	1040
0.46	1080
0.44	1120
0.42	1160
0.40	1200
0.38	1240
0.36	1280
0.34	1320
0.32	1360
0.30	1400
0.28	1440
0.26	1480

## MAGNESIUM (Mg) TEST KIT

### Magnesium in the Aquarium

Magnesium is one of the most overlooked elements in the reef aquarium yet maintaining the correct magnesium (Mg) level is crucial for success with regard to calcification in stony corals, coralline algae, clams, and some soft corals.

Magnesium is used up in the growth of your corals in the same way as calcium and alkalinity and so it is important to be able to measure and maintain the level in you tank.

The correct magnesium level also allows other parameters to be stabilised effectively such as calcium and alkalinity and therefore pH.

Insufficient magnesium can lead to a reduction in growth rates which may cause stress to aquarium inhabitants and increasing inability to maintain the correct alkalinity and calcium.

Natural seawater has a magnesium concentration of approximately 1280ppm however it is recommended that levels within the aquarium should be maintained between 1250 and 1350 depending on the salinity.

**Maximum increase in magnesium should be 25ppm/day.**

### Instructions for use.

READ IN COMBINATION WITH THE PICTOGRAPHIC INSTRUCTIONS ON EACH RELEVANT TEST CARD

**Step 1:** Using the large (6ml) syringe, add exactly 2ml of aquarium water to the test vial.

**Step 2:** Add 5 drops of magnesium reagent A to the test vial swirling vigorously for 15 seconds after each drop.

The solution should become cloudy indicating that a precipitate is forming. Reseal the reagent bottle immediately after use.

**Step 3:** Add 5 drops magnesium reagent B and shake for 2 seconds. Cap reagent B bottle immediately after use.

**Step 4:** Wait for 1 minute. The colour should be red as on the colour card and the precipitate will be seen at the bottom of the vial.

**Step 5:** Push the RED plastic tip firmly onto the end of the 1ml 'BLACK' syringe. Red tip matches bottle label colour.

**IMPORTANT:** It is **VITAL** to use the **BLACK** syringe for the **CALCIUM AND MAGNESIUM TESTS ONLY** and to clean it out in **RO water both before and after each use as although the two titration solutions contain the same reagent, they are both of different strengths and cross contamination will produce an error in results.**

**Always return the material to the correct bottle by ensuring that you only have one test kit out at a time.**

**Step 6:** Fill with magnesium reagent C until the bottom of the plunger seal is level with the 1ml line on the syringe, (see image on pictographic instructions).

There will always an air pocket near the plunger in the syringe which will not affect the result. Avoid drawing further air into the chamber as this may affect test accuracy. If bubbles are drawn into the syringe then return the liquid to the bottle and start again. Replace the lid on reagent bottle immediately after use.

**Step 7:** Hold the syringe in one hand and the test vial in the other.

Add the magnesium reagent C solution drop wise to the vial whilst swirling between each addition and looking through the **SIDE** against a white piece of paper.

It is possible to add the first third of the syringe relatively quickly as this corresponds to a magnesium level below 800ppm.

Slow the addition rate down and continue to add drop wise ensuring that you swirl the vial strongly for two seconds to fully mix each extra drop into the solution.

The colour will start to turn from red to purple until the one last drop removes any final hint of red producing a pure blue colour.

This is the end point of the titration at which point the colour should match the swatch on the instruction card.

If left the color will return from blue to violet however this has no significance on the test.

**Step 8:** Read off the amount of magnesium reagent C 'remaining' in the 1ml syringe and refer to the following chart to determine the magnesium level in your sample.

Any remaining reagent in the syringe can be returned back to the magnesium reagent C bottle.

## ALKALINITY / KH TEST KIT

### Alkalinity in the Aquarium

Maintaining correct alkalinity is crucial for success in marine aquaria as both a factor in calcification in stony corals and clams, and as a buffer to stabilise pH.

Insufficient alkalinity leads to a reduction in the ability for the water to maintain a stable pH value which may cause stress to aquarium inhabitants.

Correct levels of Alkalinity should be maintained at all times in balance with Magnesium and Calcium.

Natural seawater has an alkalinity of 2.5 meq/L, equivalent to 7.0 dKH (German Carbonate Hardness scale).

Most reef aquariums are recommended to be maintained at 7.0 – 8.4 dKH to allow additional buffering in the system to stabilise the general tendency towards falling pH.

### Instructions for use.

READ IN COMBINATION WITH THE PICTOGRAPHIC INSTRUCTIONS ON EACH RELEVANT TEST CARD

**Step 1:** Using the large (6ml) syringe, add exactly **10ml** of aquarium water to the test vial.

**Step 2:** Push one clear plastic tip firmly onto the end of the 1ml 'GREEN' syringe and leave it on.

**IMPORTANT:** It is **VITAL** to use the **GREEN** syringe for the **KH / ALKALINITY TEST ONLY** and to clean it out in **RO water both before and after each use as cross contamination will produce false results. Note: The green syringe matches the green label on the reagent.**

**Always return the material to the correct bottle by ensuring that you only have one test kit out at a time.**

**Step 3:** Fill with KH / Alkalinity reagent until the bottom of the plunger seal is level with the 1ml line on the syringe, (see image on pictographic instructions).

There will always an air pocket near the plunger in the syringe which will not affect the result. Avoid drawing further air into the chamber as this may affect test accuracy. If bubbles are drawn into the syringe then return the liquid to the bottle and start again. Replace the lid on reagent bottle immediately after use.

**Step 4:** Hold the syringe in one hand and the test vial in the other.

Add the KH / Alkalinity solution drop wise to the vial whilst swirling between each addition and looking through the **SIDE** against a white piece of paper.

The initial drops will turn the sample blue which will then turn towards purple as the end point is approached. Add further reagent dropwise until the solution matches the 'end' colour on the card. If the end point is missed then the 'overdose' colour will be observed. Repeat test.

**Step 5:** Read off the amount of KH / Alkalinity reagent 'remaining' in the 1ml syringe and refer to the following chart to determine the alkalinity level in your sample.

Any remaining reagent in the syringe can be returned back to the KH / Alkalinity bottle.

If after adding the full 1ml of titrant to the test vial there is still no change, then the KH / alkalinity level is above 14 dKH / 5.0 meq/l. Refill the syringe and continue to add reagent until the end point is reached.

Add the readings from the first and second syringes together to get the final reading.

When testing the outlet from a calcium reactor you may need to add 3 or more syringes to get to the end point and should add the results together in the same way.

### Calcium Reactors

In a calcium reactor alkalinity and calcium are produced in balance and it is therefore possible to use a KH or alkalinity measurement to assess the efficiency of the reactor.

The higher the KH in the effluent the higher the calcium level and more calcium that is being added to the tank over a period of time.

Many low efficiency reactors achieve a dKH level of less than 30 which means that you have to run either a larger reactor or run for a longer period of time to add a sufficient amount of calcium.

The average level to try to achieve in a calcium reactor is about 45 dKH and this can be measured with this test kit by adding just over 3 syringes of solution.

It is possible in more efficient reactors like the Deltec fluidised versions to achieve a dKH of up to 80 which indicates that there is twice as much calcium per drop from the reactor compared with one running at 40.

Note that the solution should be clear before testing as fines in the sample can affect results.

### Alkalinity/KH Level Chart

Remaining Reagent in Syringe	Alkalinity level in Sample	dKH Level in Sample
0.00	5.00	14.0
0.05	4.75	13.3
0.10	4.50	12.6
0.15	4.25	11.9
0.20	4.00	11.2
0.25	3.75	10.5
0.28	3.60	10.1
0.30	3.50	9.8
0.32	3.40	9.5
0.34	3.30	9.2
0.36	3.20	9.0
0.38	3.10	8.7
0.40	3.00	8.4
0.42	2.90	8.1
0.44	2.80	7.8
0.46	2.70	7.6
0.48	2.60	7.3
0.50	2.50	7.0
0.52	2.40	6.7
0.54	2.30	6.4
0.56	2.20	6.2
0.58	2.10	5.9
0.60	2.00	5.6
0.65	1.75	4.9
0.70	1.50	4.2
0.75	1.25	3.5
0.80	1.00	2.8
0.85	0.75	2.1
0.90	0.50	1.4

### Contents:

CALCIUM  
Calcium reagent A  
Calcium powder B  
Calcium reagent C

ALKALINITY  
Alkalinity reagent

EQUIPMENT  
6ml syringe  
1 x black 1ml syringe  
1 x green 1ml syringe  
2 x glass vials + stoppers  
Plastic spoon  
3 plastic tips

MAGNESIUM  
Magnesium reagent A  
Magnesium reagent B  
Magnesium reagent C

### WARNING INFORMATION



CORROSIVE

**Contains - Potassium hydroxide, Ethylene glycol.  
Harmful if swallowed.**

**Causes burns.**

**Keep locked up and out of reach of children.**

**Keep container tightly closed.**

**In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.**

**After contact with skin, wash off immediately with plenty of water.**

**Wear suitable gloves and eye/face protection.**

**If swallowed seek medical advice immediately and show this container or label.**

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Instructions available for download at our website:

**www.theaquariumsolution.com**