General Guide for the ZEOvit System
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The intent of this "guide" is to assist you during the start-up phase and general use of the ZEOvit® system (by Korallen-zucht.de), as well as to give you a basic understanding of how the system works.

The system consists of two columns, which are described as follows:

Column 1 is the base system consisting of components to minimize nutrient levels.

Column 2 deals with coral coloration and food in a nutrient poor system while maintaining "near natural" conditions.

The base system involves the effective reduction of nutrients and maintenance of water conditions close to the parameters corals encounter in their natural habitat. This column consists for the following components:

1. Balanced mix of zeolites (ZEOvit®)
2. Microorganism solution (ZEObac)
3. Combination product of bacteria and coral food (ZEOfood7)
4. Bacteria food (ZEOstart)
5. Constant filtration with activated carbon

The following requirements are also necessary for the ZEOvit® method to be successful:

6. Efficient strong skimming
7. Sufficient lighting
8. Optimization of nutrient addition
9. Addition of elements at low levels
10. Optimum water parameters (Ca, Mg, K+, KH, salinity)
11. Regular weekly water changes
12. Sufficient water flow
13. Use of live rock etc.

The goal to be achieved:

The purpose of the system is to create a low nutrient, near natural levels, environment. The goal is to reduce measurable levels of nitrate (NO_3) and phosphate (PO_4) without lowering the levels of important minerals, like calcium (Ca), magnesium (Mg), Potoassium (K+) and carbonate hardness (KH), such that addition of these trace elements is minimal.

1. Balanced mix of zeolites (ZEOvit®)

Zeolites are a group of natural occurring minerals that exist worldwide. Their chemical composition can vary greatly and therefore exhibit different properties of adsorption, ion exchange or molecular retention. Today's modern industrial applications require very specific properties and therefore most of the zeolites used are either modified natural zeolites or completely synthetically manufactured.

Our mix consists of three different zeolites. These zeolites were chosen because of their ability to reduce certain toxins in a balanced manner. The functional life of the mix is limited and has to be exchanged every 6-12 weeks depending on the tanks nutrient load. The replacement of old zeolite material with new can be conducted in a single session. The useful life is directly related to the tanks nutrient level. The higher the load of organic compounds (phosphate - PO_4 and nitrate - NO_3), a shorter interval for material exchange is required.

It is important to have sufficient water flow through the filter material (200-400 liters per 1 liter of ZEOvit®). **We strongly recommend not exceeding the maximum flow rate of 100 gph per 1 liter of ZEOvit®, which could undoubtedly have a negative impact.** High water flow through the media in already stocked tanks, especially during the start up of this system, has shown to cause slow tissue loss in SPS corals. **We recommend a lower flow rate through the media during the first few weeks of introduction of this method to a tank already stocked with corals.** The effectiveness of this system in reducing nutrients could result in changes that are to abrupt when higher flow rates are used. However, corals need time to "adapt" to these new nutrient conditions.

We also recommend against use of phosphate absorbers, no matter if iron or aluminum based, when using this system. The system by itself is able to lower and maintain low levels of PO4 very effectively.

The amount of ZEOvit® used is 1 liter per 100 gallons of water. It is important not to exceed this recommended amount, because excessive amounts of ZEOvit® could have a negative effect on SPS corals and lead to tissue necrosis and therefore coral death. Signs of overdose are tissue loss starting from the coral tips or the complete loss of all tissue within a short period of time (i.e., rapid tissue necrosis, RTN). This problem occurs usually because of the rapid change in nutrient conditions in the tank. As mentioned above, corals need time to adapt to changes and an overdose does not allow

for gradual changes. In order to calculate the required amount of material, take the gross water volume of the total system and subtract approximately 20% for an average decorated tank to come up with the net water volume. Use this net water volume to determine the required amount of ZEOvit®.

We recommend using only 60% of the required material for the first interval if your corals display high levels of zooxanthellae (i.e., dark brown with dull tissue appearance because of unnaturally high nutrient load).

Rinse the ZEOvit® material very well with fresh water before use so that fine particles created by abrasion during transportation are removed. An initial cloudiness in the water during introduction of new material is not harmful to living organisms and usually disappears within an hour.

It is important to clean the material daily to maintain optimum performance. The filter specifically designed for the system makes it possible to accomplish this task within a minute. The filter system consists of a cylindrical tube in which water from the tank flows from the bottom to the top. The ZEOvit® material is placed on top of a perforated plate, which is connected to a PVC rod. To clean the material, push and pull the rod (about 2-4 inches) approximately 10 – 15 times. Keep the filter pump running during this cleaning process. If possible, we recommend doing this cleaning once or twice daily. It is not detrimental, if you are unable to perform this task for several days. Return to the regular cleaning schedule as soon as possible. Suitable filters can be obtained from us or from one of our dealers.

The mulm, released from the ZEOvit® material, contains bacteria that are used as food by the corals. We therefore recommend placing the ZEOvit® filter after the skimmer in the last compartment of the sump. This is very important because it provides nutrients to the animals. This procedure has a very positive impact on colors, polyp extension, and vitality of the corals. Large Polyped Corals (LPS) react with fully expanded tissue.

The material does not directly remove nitrite (NO_2), nitrate (NO_3), or phosphate (PO_4) from the tank water. It permanently absorbs ammonium (NH_4^+) and ammonia (NH_3), the first two chemicals in the nitrification cycle, thus preventing the formation of nitrite (NO_2) and nitrate (NO_3).

Certain other elements are adsorbed as well and require addition to counteract depletion, which would have a negative effect on the environment. We strongly recommend replenishing those elements and we offer supplements to be used with this system.

At this point we would like to warn you not to use just any zeolite. There are several hundred different materials with this name. Every zeolite has been designed or modified for a specific use. Using a zeolite with the wrong properties could have detrimental effects on your tank and lead to the loss of all animals. Such total crashes have been reported to us in the past when the wrong zeolites were used. A visual selection or comparison is not possible since different zeolite material often looks alike. For the safety of your animals, only use zeolites that are packaged in ZEOvit® bags. You can see a picture of it on our homepage (www.korallen-zucht.de

or www.captiveoceans.com). We recommend not using the material if the bag looks different.

You should connect the ZEOvit® filter pump to an automatic timer if you have a high nutrient load or during the starting phase of the system. The pump should be switched on and off at an interval of 3 hours (3 hours on, 3 hours off, 3 hours on, 3 hours off, etc.) leading to an alternating environment of aerobic and anaerobic conditions. Every switch leads to an increased aspiration of PO_4 by the microorganisms/bacteria residing in the material. This is not absolutely necessary in stable and very nutrient poor tanks. Please make sure that the media won't be exposed to air while the pump is off. This could damage the micro-organisms/bacteria that has populated the area. An example would be a filter that sits above the tank. In such a case it would be possible to place the ZEOvit® filter within the aquarium.

Dosing:

A) Amount to be used in newly established tanks with fresh water and live rock (non-stocked):

Use 1 liter ZEOvit® per 100 gallons net water volume with two exchange intervals of 4 weeks each. Subsequent dosing should follow that designed for tanks that are nutrient poor and running stable with ZEOvit® system. Water flow through the media should be between 50 and 100 gallons per hour.

B) Amount to be used in tanks with high nutrient load and in tanks using ZEOvit® for the first time (already stocked):

Use 1 liter ZEOvit® per 150 gallons net water volume with exchange interval of 6 – 8 weeks. Subsequent dosing should follow that designed for tanks that are nutrient poor and running stable with ZEOvit® system. Water flow through the media should be 50 – 60 gallons/hour per 1 liter of ZEOvit® during the first few weeks.

C) Amount to be used in tanks, which are nutrient poor and running stable with ZEOvit® system (already stocked):

Use 1 liter ZEOvit® per 100 gallons net water volume with exchange interval of 6 – 12 weeks. Water flow through the media should be 50 - 100 gallons/hour per 1 liter of ZEOvit®.

Used in a ZEOvit® filter and cleaned daily as described above to remove any build up and to release mulm.


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2. Microorganism solution (ZEObac)

This liquid solution contains several bacterial strains. The added microorganisms can be used as a food source by the corals. ZEObac consists of different bacterial strains that form a chain for nutrient reduction. An interruption of this chain leads to a disturbance and the accumulation of unwanted substances. For this reason, renewed dosing of the bacterial solution is recommended. Interruption in dosing for a long period of time will inevitably lead to a so-called monoculture. The added microorganisms work in principle as a chain reaction, which reduces substances step by step until the skimmer is able to permanently remove it from the tank. The result can be seen in the increased concentrated adsorbent in the protein skimmer the days following. It should be dosed for a period of 10-14 days after every exchange of ZEOvit® (and for the initial use of ZEOvit®). In order to maintain the microorganisms, we recommend an additional dose outside of this period once or twice weekly at the same dosing rate. Over dosage in a nutrient poor environment leads to a darkening of the coral tissue.

This product has a limited shelf life because it contains cultures of living microorganisms. Unopened, it will last for at least 6 months if kept refrigerated. After the bottle is opened, the shelf life is approximately 3 months. Spoiled strains can be identified by a foul odor. If this is the case, some of the microorganisms are dead and the solution cannot be used. We recommend purchasing a bottle size that can be used in a 3-month period. It is better to purchase smaller amounts on a more frequent basis. Please make sure to avoid any contamination of the solution in the bottle (e.g. with aquarium water).

Dosing:

A) Amount to be used in newly established tanks with fresh water and live rock (non-stocked):

During the start of the ZEOvit® system:

2 - 4 drops per 25 gallons net water volume daily over a period of 2 weeks.

Subsequently, dose 1 - 2 drops per 25 gallons net water volume once or twice weekly until the change of ZEOvit®.

After the first exchange of ZEOvit®:

Every other day 1 drop per 25 gallons net water volume over a period of two weeks.

Subsequently, dose 1 drop per 25 gallons net water volume two to three times weekly.

B) Amount to be used in tanks with high nutrient load and in tanks using ZEOvit® for the first time (already stocked):

During the start of the ZEOvit® system:

Dose 1 drop per 25 gallons net water volume daily over a period of 2 weeks.

Subsequently, dose 1 drop per 25 gallons net water volume two to three times weekly until the change of ZEOvit®.

After the first exchange of ZEOvit®:

Every other day 1 drop per 25 gallons net water volume over a period of two weeks. Subsequently, dose 1 drop per 25 gallons net water volume two to three times weekly.

C) Amount to be used in tanks, which are nutrient poor and running stable with ZEOvit® system (already stocked):

Dose 1 drop per 25 gallons net water volume every three days over a period of 2 weeks every time ZEOvit® is exchanged. Otherwise, dose 1 drop per 25 gallons net water volume once or twice weekly.

Please keep in mind that the 3 different phases may vary in duration considerably. We recommend adjusting the dosing to the phases accordingly.

3. Combination product of bacteria and coral food (ZEOfood7)

This substance is also delivered in liquid form, dosed at the same time and in combination with the microorganism solution (ZEObac). The purpose of this product is twofold:

Multiplication and food for the dosed microorganisms and

Food source for corals

ZEOfood7 contains amino acids as well as several vitamins, which enable the coral to take up necessary nutrients leading to natural coloration.

We have chosen to describe our products with version numbers because of the continued improvement of the system. The products are appropriately named including the number of the version (e.g. ZEOfood7). Starting with version 7 of this product (ZEOfood7 7), a darkening of the tissue will not occur, even if over dosed heavily. Another indicator is the formation of a heavy bacterial film on the decoration and the tank glass/walls. Even though this film is welcome, it should be kept low for purely esthetic reasons.

Similar as with ZEOstart, it is possible that a visible brown or light green bacterial film builds that looks like a diatom bloom. When this occurs, we recommend that dosing of ZEOfood7 and ZEOstart be ceased for a few days until the film is gone. This film usually builds when there is an over dosage. We recommend adjusting your dosing amount accordingly.

Dosing:

A) Amount to be used in newly established tanks with fresh water and live rock (non-stocked):

During the start of the ZEOvit® system:

2 – 4 drops per 25 gallons net water volume daily over a period of 2 weeks.

Subsequently, dose 1 –2 drops per 25 gallons net water volume once or twice weekly until the change of ZEOvit®.

After the first exchange of ZEOvit®:

Every other day 1 drop per 25 gallons net water volume over a period of 2 weeks. Subsequently, dose 1 drop per 25 gallons net water volume two to three times weekly.

B) Amount to be used in tanks with high nutrient load and in tanks using ZEOvit® for the first time (already stocked):

During the start of the ZEOvit® system:

Dose 1 drop per 25 gallons net water volume daily over a period of 2 weeks.

Subsequently, dose 1 drop per 25 gallons net water volume two to three times weekly until the exchange of ZEOvit®.

After the first exchange of ZEOvit®:

Every other day 1 drop per 25 gallons net water volume over a period of two weeks. Subsequently, dose 1 drop per 25 gallons net water volume two to three times weekly.

C) Amount to be used in tanks, which are nutrient poor and running stable with ZEOvit® system (already stocked):

Dose 1 drop per 25 gallons net water volume every third day over a period of 2 weeks every time ZEOvit® is exchanged. Otherwise, dose 1 drop per 25 gallons net water volume once or twice weekly.

Please keep in mind that the 3 different phases may vary in duration considerably. We recommend adjusting the dosing to the phases accordingly.

4. Bacteria food (ZEOstart2)

This product is a liquid food source and promotes the reproduction of all nitrifying bacteria in the aquarium. It is therefore very effective in reducing phosphate (PO_4) and nitrate (NO_3.)

We recommend continuous daily use of this product as a food source for nitrifying bacteria. For above-mentioned reasons, be careful and alert. With sustained overdosing, it is possible that a visible brown or light green bacterial film builds that looks like a diatom bloom. This film usually builds when there is an over dosage. When this occurs, we recommend that dosing of ZEOfood7 and ZEOstart be ceased for a few days, until the film is gone. We recommend adjusting your dosing amount accordingly. Daily dosing has shown to be necessary in practical tests in order to avoid large „variations" in bacteria population. **Therefore, we strongly recommend dosing smaller amounts throughout the day (if possible, split between morning and evening dosing) rather than larger amounts infrequently.** Our observations have shown positive effects on coral coloration when the nutrient level can be kept very close to detectable levels. Excessive dosing can have a negative impact on PO4 and NO3 reduction. If these parameters are not dropping lower after a few weeks of dosing it is recommended to reduce the dosing amounts.

Dosing:

A) Amount to be used in newly established tanks with fresh water and live rock (non-stocked):

Dose 5 ml per 25 gallons net water volume daily for 2 – 3 days.

Subsequently, dose 1 ml per 25 gallons net water volume over a period of 2 weeks.

Subsequently, dose like in tanks that are nutrient poor and stable running with the ZEOvit® system.

B) Amount to be used in tanks with high nutrient load and in tanks using ZEOvit® for the first time (already stocked):

Dose 2 ml per 250 gallons net water volume daily.

Subsequently, dose like in tanks that are nutrient poor and stable running with the ZEOvit® system.

C) Amount to be used in tanks, which are nutrient poor and running stable with ZEOvit® system (already stocked):

Dose continuously 1 – 2 ml per 250 gallons net water volume daily depending on nutrient conditions.

Good results were achieved when dosing was done 2 - 4 times daily with the aid of a dosing pump. Please keep in mind that a high quality and reliable dosing pump should be used to assure proper dosing amount and error free operation. Check the dosing amount on a regular basis when using a dosing pump.

We generally recommend using the lower dosing and water flow amounts until you get comfortable with the system. As mentioned before, corals require a certain period of time to acclimate to the parameters of their environment. The more time you give your tank for these changes the less problems will occur. Please don't treat this system with the „more is better" philosophy.

In case you are absent and you are unable to dose or „stir" the media on a daily basis, just pick up where you left off upon your return.

5. Constant filtration with activated carbon

We recommend the continuous use of our high quality activated carbon for filtration. The effect of activated carbon can vary greatly, therefore we recommend against the use of any other brand. Use 0.5 to 1 liter of activated carbon passively in a mesh bag per 250 gallons of tank water. Completely replace the activated carbon every 30 days. This will keep your tank water crystal clear allowing for unrestricted and true light penetration. Our carbon adsorbs several proteins (similar to a skimmer) as well as toxins released by corals. In order to maintain the efficiency of the carbon, we recommend kneading the mesh bag every couple of days. This will keep channels from forming. We recommend using activated carbon in a filter with forced flow. Tests have shown that the appropriate amount of carbon can also be placed in the filter on top of the zeolites. We would like to point out that during tests of various brands of activated carbon, some had negative effects on coral coloration.

The water will become more clear with this active carbon use, allowing increased light transmission to our reef, therefore, precautionary steps may need to be taken to avoid too much light-stress to our corals, such as raising our main lighting pendants, shortening the photoperiod, or both. If you employ high powered lighting, we recommend to slowly increasing the amount used in 2 steps. The increased water clarity can lead to coral tissue damage. In case of strong active application, we recommend to use 50% of the carbon used passively.

We recommend not using a higher amount of activated carbon then mentioned above.

Place the carbon in a mesh bag (or nylon sock) and soak it in RO water that is heated to approximately 90 degrees Celsius. Let it soak for about 24 hours while it cools before placing it into your system. The carbon can be rinsed from the carbon dust in the RO water as well. The blackening from the carbon will not have a negative impact on your system.

Dosing (passive flow):

A) Amount to be used in newly established tanks with fresh water and live rock (non-stocked):

Continuous use of 0.5 to 1 liter of activated carbon per 250 gallons net water volume, exchanged every 30 days.

B Amount to be used in tanks with high nutrient load and in tanks using ZEOvit® for the first time (already stocked):

Continuous use of 0.5 to 1 liter of activated carbon per 250 gallons net water volume, exchanged every 30 days.

C) Amount to be used in tanks, which are nutrient poor and running stable with ZEOvit® system (already stocked):

Continuous use of 0.5 to 1 liter of activated carbon per 250 gallons net water volume, exchanged every 30 days.

In summery, with the use of the four mentioned elements, it is possible to reach near natural levels of compounds measurable by aquarists. Keep in mind; every tank is different with its own environment. There are variations, not only with the nutrient-producing animals, but also with the kind and amount of microorganisms. The amount of nutrient consumers (e.g., corals) makes it virtually impossible to give an exact dosing recommendation. In order to reach the full potential of the system, we recommend using the above mentioned dosing amounts and dosing intervals to slowly find the optimum values for your system without overdosing.

However, near natural water conditions are not enough to achieve the desired growth rates, as well as promotion of intense colors. Some secondary conditions are also required which will be described below.

Positive effects could be observed when amino acids were used during the transition to a low nutrient environment. We recommend the use of our product "Amino Acid High Concentrate" for SPS corals and "Amino Acid LPS" for large polyped stony and soft corals. The use of our coral food, Pohl's Coral Vitalizer, has shown to be beneficial to the corals in this environment.

We would like to emphasize that the use of Ozone or UV sterilizers are not possible with this system. The added microorganisms and elements will be destroyed by its use.

6. Efficient strong skimming

As mentioned earlier, the basis of this method relies on export of harmful substances through skimming. Continuous use and frequent cleaning should be conducted in order to keep the skimmer performing at its maximum level. The results are better when the skimmer is adjusted in order not to produce too much concentrated skimmate (wet skimming). We would like to point out that it is our thought that needle wheels may precipitate certain elements and destroy plankton. These elements, e.g. such as potassium, will need to be re-added to the system. Do not use a skimmer that is too oversized or employ wet skimming if you use a needle wheel skimmer. We recommend the use of venturi type skimmers.

7. Sufficient Lighting

We recommend the use of metal halides with a color temperature of 10,000 – 14,000 Kelvin (e.g. BLV), since this bulb produced the best results in practical experiments. In these tests, these bulbs brought the most intense and best colors in corals grow-out and holding tanks. Because the color of this bulb appears to yellow to the human eye and many prefer the bluer spectrum, it is possible to supplement it with the appropriate blue bulbs. We use exclusively T5 bulbs because of the highest efficiency available with the reflectors. The intensity, as well as the spectrum of the light, plays a major role in coral coloration.

Or: Another real alternative is lighting strictly with T5. We achieve great results in our tanks as far as growth and coloration is concerned with Korallenzucht Coral Light and Fiji Purple bulbs. We use a combination of 2 ; 4 (Fiji Purple/Coral Light) at an intensity of approximately 550 Watts per m^2. The bulbs are replaced every 6-8 weeks to assure best results.

8. Optimization of nutrient addition

Keeping with the goal of the system to reach a low nutrient environment, it is necessary to limit introduction of nutrients with top off water and to keep feeding to a minimum. There are several ways to do this. We recommend removal of dissolved solids by means of a reverse osmosis system for water changes and top off water. It is helpful to use a de-ionization unit after the RO unit. Another source of nutrients comes from fishes. Their fecal matter, as well as uneaten food, adds to accumulation of nutrients in the water. Feeding small portions with the pumps turned off keeps food from drifting into the decoration and limits the resulting decomposition process of nitrite (NO_2), nitrate (NO_3), and phosphate (PO_4). The amount and type of fishes should be adapted to the type and size of the system.

9. Addition of elements at low levels

Low nutrients, of course, also apply to the addition of elements. We advise against high amounts of additives in this environment because problems will occur sooner or later. I attribute these problems to the slow, but steady accumulation of unused substances. In this case, less is often more. Many of the added elements have toxic effects on the animals if they reach certain levels and, therefore, bring more disadvantage than advantage. This is the point that requires some kind of change in the train-of-thought with this system. Regular addition of elements in very small amounts and scheduled water changes are enough to avoid deficiencies in the corals. It is impossible to recommend certain amounts since every tank is different. The kind of equipment, as well as stocking of the tank, requires high levels of individuality. The observation skills of the person taking care of the corals are very important. One must keep in mind that additions in this environment have delayed reactions of 2-3 days. This fact is very important when adding elements. We recommend, when dosing elements with unknown effects, to dose carefully and only once. Wait a few days and observe your corals reactions. A very helpful parameter is the coloration of your corals. The tissue should remain light and the coloration should be intense as they display in nature.

Provided that measurable parameters of nitrate (NO_3) and phosphate (PO_4) are consistently at low levels, any darkening of tissues and disappearance of coloring is almost always an indication of over dose. In our opinion, this is a much better indicator than the questionable results of many test kits. Sometimes the visual observation can lead to great differences in concentration readings due to the subjective interferences required in these test kits.

As long as parasites are not an issue, subdued colors and dark or brown tissue is, in most cases, is the result of high nutrients. It can be assumed that either nitrate (NO_3) or phosphate (PO_4) is present or too many other elements are available.

We do not recommend the addition of the following products from the start. Allow the necessary time for your corals to adjust to the new environment. We recommend dosing these products after coral tissue becomes lighter. The proper time to do this can vary greatly and depends on your tanks starting nutrient load.

The following reactions can be observed when dosing the described elements and should help in determining dosing rates:

Potassium iodide / fluoride concentrate:

The addition of this supplement leads to improved blue colors in SPS. In contrast to PVP iodide or Lugols Iodide solution, there is no tissue darkening as long as the amount is appropriate. As a starting dose we recommend to dose 1 drop per 25 gallons, however the dosing amount and interval should be adjusted to your tank. A very good indicator for dosing is yellow coral. If your yellow corals display a green shimmer, it is an indicator of over dosage of this product (or iron concentrate). When this happen, we recommend that dosing be ceased until coral colors become intense yellow again. With blue acropora, dosing should be done when colors become less intense. In most cases, dosing twice weekly at a rate of 1 drop per 100 liters should be sufficient. This supplement can also be used in tanks not using the ZEOvit® method.

Iron Concentrate:

The addition of iron primarily affects the green color formation. However, this element has to be treated with caution. Iron is known to increase coral growth, but also the growth of algae. You can see the same result in the density of zooxanthellae in coral tissue. Darkening of tissue suggests too much iron is being added. As an initial dosing regimen, we recommend 1 drop per 25 gallons daily. This dosing amount and interval should be adjusted accordingly. We recommend using yellow corals as indicators. Stop dosing when yellow corals display a green shimmer. Stop dosing this product (or potassium iodide / fluoride concentrate) until yellow corals become intense yellow again. In most cases, dosing twice weekly at a rate of 1 drop per 25 gallons should be sufficient.

(Another indicator that your corals lack iron: red acropora turns pale pink and green acropora turns yellow.) This supplement can also be used in tanks not using the ZEOvit® method.

Macro element solution (ZEOspur Macroelements concentrate)

This product supports growth as well as color formation. This product does not contain the "standard" elements but rather elements missing from synthetic salt mixes. However, these elements are available at very low concentrations in natural seawater. We recommend dosing once weekly at a rate of 5 ml per 25 gallons in heavy stocked tanks and less in tanks with fewer animals. This supplement can also be used in tanks not using the ZEOvit® method.

Stylo – Pocci -Glow

This product "regulates" the density of zooxanthellae in pocillopora, stylophora and seriatopora. The reduction of zooxanthellae allows for better visibility of lower lying tissue colors. A general lightening of the above-mentioned species is possible with this product. It takes about 14 days to reach the highest level of coloration when using this product. We recommend dosing be stopped at that point until colors become darker again. We recommend addition at a rate of 2 drops per 25 gallons every time these coral species become darker again. Start dosing again and repeat the above steps. This supplement can also be used in tanks not using the ZEOvit® method.

Amino Acid High Concentrate

This product primarily aids growth as well as vitality. Our experiments have shown that corals can increase growth by up to 100%, even if placed in low light spots. Polyp extension is also maximized. We exclusively use amino acids that are available in the wild and can be utilized by the corals. We recommend dosing of 1 drop per 25 gallons daily. Over dosing is not a factor, as long as there is no problem with brown slime algae. It is possible that coral tissue darkening occurs if there is a continued overdosing. In that case, reduce the dosing amount to 1/3rd. You should not have a problem with this, if you follow the dosing instructions. However, if signs of excessive dosing occur, stop dosing for a few days until the slime build-up is gone. This supplement can also be used in tanks not using the ZEOvit® method.

Amino Acid Concentrate LPS

This product is a high quality food source based on amino acids, designed specifically for large polyped stony corals (LPS) such as Cynarina, Blastomusa, Welsophylia, Symphylia, Musidae, Fungias, Heliofungias, and Catalaphylia. Corals expand their tissue immediately after dosing. Regular dosing has a positive impact on coral growth. It can help in the regeneration process of damaged corals. We recommend to use this product especially during the initial change of the system to a low nutrient environment, because the slow acclimation of these coral species. We recommend dosing 1 ml per 50 gallons daily. Reduce the dosing amount if the tissue color of the corals becomes browner.

Trace element solution (ZEOspur2)

It is possible with this product to influence the amount of zooxanthellae in the coral tissue. The coral itself has more energy for growth because the zooxanthellae density requires less energy. This is possible for acropora, anacropora and montipora. The reduction of zooxanthellae in the outer layers brings out the colors of the coral from deeper layers. ZEOspur2 is also able to influence colors. However, the primary color shown will be the color right below the layer with the zooxanthellae. It is possible to reduce the amount of zooxanthellae so much that the coral will not get enough energy via photosynthesis. This condition can be maintained for a long period of time without damage to the coral. However, our experiments have shown that **continued** overdosing, and only under this condition, coral tissue will become thinner and thinner and ultimately completely dissolve. We recommend dosing every 14 – 21 days. It is important to apply the full dose all at once or there will no be any changes. The reduction of zooxanthellae occurs within 48 hours and also reaches its highest point at that time. The reaction and, therefore, the dosing amount are different from tank to tank. We recommend starting at 50 % of the recommended amount to get a feel for the product. Subsequently, you can increase the dosing amount, not the interval, by 10% each time to find the perfect dosing amount. The maximum dosing amount is 1 ml per 25 gallons and should not be exceeded. We do not recommend the use of this product during the initial starting phase of the ZEOvit® system. There is too much change and your corals will not have enough time to adjust safely. We would like to mention at this point that this product has the fastest and most drastic impact of the whole system. The optimum dosing, in this case, is absolutely necessary in order not to damage your corals.

Pohl's Coral Vitalizer (Natural Coral Food)

Our new coral food is now available after extensive development. This concentrate contains both liquid and solid elements, providing food to SPS corals and as well as several soft corals. It does not contain phosphates (PO4) or nitrates (NO3). Positive effects can be noticed after 7 – 10 days if the dosing is daily. You will notice increased polyp extension, even during the light period, after the corals have had a chance to get used to the new food source. This food source does not increase the zooxanthellae reproduction even if overdosed. Corals retain their bright, natural color and increased growth.

The bottle should be stored in a refrigerator and has a shelf live of 12 months. We recommend daily dosing (during the dark period if possible) of 1 – 3 drops per 25 gallons. Adjust the dosing amount accordingly to your tank stocking level.

Pohl's Coral Snow

Coral Snow is a liquid form secondary biological facilitator for elements such as B-balance and Potassium-Iodide/Flouride Concentrate. It is also compatible with Amino Acids and Coral Vitalizer. Coral Snow contains a natural calcium-magnesium carbonate among other ingredients. The particles as well as the other compounds can be taken up directly by the corals. Coral Snow neutralizes unwanted acids and yellowing compounds and can be beneficial in the prevention of e.g. slime algae and cyano bacteria. We dose Coral Snow daily, **every time with a different element**, The necessary amount of Coral Snow is poured into a small container and mixed with the to be dosed element. Gently mix and let it sit for about 5 minutes. Then add it directly to the tank at an area with high water flow.

You can use 0.5 to max. 4 ml Coral Snow per 25 gallons daily. The initial cloudiness is not harmful to fishes or even the most sensitive corals. We have been successful eliminating cyanobacteria with the help of Coral Snow. In order to do that, add 1 drop of ZEObac per 25 gallons of tank water to the Coral Snow. Dose every two days until cyanobacteria is gone.

It is not necessary to turn the skimmer down or off during dosing. You will notice the water is extremely clear after the initial cloudiness disappears. It appears very similar to when fresh activated carbon is placed into a tank. Please be aware that the clear water in combination with intense lighting can initially burn your corals. We recommend you raise your lights for about a week if that occurs.

B-Balance

B-Balance contains important minerals and additives. We set out to find why blue cespitularia spp. stop growing and ultimately die after a few weeks or months. B-Balance is a supplement that allows you to keep and propagate these beautiful animals. We have also noticed that stony corals, especially SPS corals, react with more intense pink and red coloration if this supplement is dosed. Corals look stronger and healthier. We recommend dosing 5 ml per 250 gallons twice weekly. B-Balance adds the elements that are partially removed via skimming, especially by needle wheel skimmers,

K-Balance and K-Balance Strong (Potassium Supplement)

Potassium is a major element im sea water at a similar concentration as calcium, at a level of 380 – 410 mg/liter. K-Balance contains multiple potassium salts as well as two additional available elements in highly concentrated form. Our tests in several tanks with a known potassium deficiency have shown the benefits within days of dosing, resulting in improved coloration and growth throughout the tank. K-Balance adds the elements that are partially removed via skimming, especially by needle wheel skimmers,

Potassium deficiency can be diagnosed in different animals as follows:

Montipora, especially plating types, display slower growth and appear washed out to grey. Latent potassium deficiency may also lead to tissue loss, spreading from one or more spots. Stylophora and Pocillopora appear as if they have been exposed to air for a long period of time. Polyps are completely withdrawn and colors are light and without depth. Seriatopora may completely loose all tissue, starting from the base, within only a few days. The pink coloration may turn into a light brown. Acropora may loose their color and get lighter and pale. Growth stops completely. If the potassium deficiency continues tissue is lost, mostly starting from the base. Tubinaria Reniformis stops growth completely and withers away.

Dosing K-Balance:

1 ml per 25 gallons daily until above mentioned symptoms disappear and growth resumes. Dosing can be continued at a rate of 0.2 ml per 25 gallons daily. Excessive dosing may lead to increased algae growth and is an indicator that the potassium levels are sufficient. Algae growth returns to normal 2 -3 days after stopping dosing.

We have found that, depending on the salt used, older established tanks often times show low concentrations of below 200 mg/l. Larger tanks therefore require a higher concentrated and differently mixed version (K-Balance Strong). This product does not contain any other elements then potassium.

Dosing K-Balance Strong:

Max. 1 ml per 25 gallons every 2 hours. We recommend to start with 0.5 ml per 25 gallons every 2 hours. Pay close attention to your K – level concentrations during that time. You should stop dosing as soon as 380 mg can be measured. If you notice after two weeks that the level has dropped again, start dosing again in lower amounts until desired value is reached. Please DO NOT dose more than 1 ml per 25 gallons every two hours.

WARNING: Only dose as recommended. This supplement is highly concentrated and excessive dosing can lead to death (burning) of the growth tips.

TIP: To induce growth and coloration of your corals, we recommend to dose this supplement in combination with our potassiumiodide-flouride concentrate 1 – 2 times weekly per 25 gallons.

To determine the potassium levels in your tank we recommend the from us for marine tanks developed K+ test. The current tank water potassium levels can be determined by looking through a test solution onto a color coded scale. Potassium levels around 380 mg do not change much if salt with sufficient potassium is used for water changes. A test every two weeks is enough in that case. Potassium levels can be raised slowly with K-Balance or K-Balance strong until the test shows a 380 mg as shown in the following picture.

This picture shows a K+ concentration of approximately 380 mg/l.

Each of the dosing amounts of these products depends primarily on the amount of animals in your tank. The recommended amounts and intervals are based on average well-stocked tanks. One hundred percent of all of these elements will be taken up and used by the corals. The more animals in the tank, the more amounts you should dose to make all elements available at all times. We strongly recommend adjusting the dosing regimen based on your corals. Please keep in mind that all of our products are highly concentrated and therefore require care when dosing.

We hope we were able to give you a good idea on each of the products with the above points. The difference between positive and negative effects is small and it is the job of each user to determine the correct dosing amount based on the corals' reaction. Many times, people make the mistake of increasing the dosing amount when coral colors turn pale. However, the opposite would be the correct measure to bring colors back to normal.

10. Optimum water parameters (Ca, Mg, KH, K+, salinity)

Parallel to a low nutrient environment, you will also have to adjust calcium (Ca), magnesium (Mg), potassium (K+) and carbonate hardness (KH) to natural levels. The following concentrations have shown to work for our customers:

	Minimum	-	Maximum
Ca	410	-	430 mg
Mg	1250	-	1300 mg
KH	6.5	-	7.5
K+	380	-	400 mg
Salinity	33	-	35 ppt

Higher concentrations show no advantage. Neither growth nor coloring in SPS corals can be positively affected. However, if any of the mentioned parameters deviates too far, the result can quickly become negative in the established environment. We recommend the addition of these minerals via calcium reactor, filled with coarse coral gravel and magnesium granulates. This will keep these parameters steady and changes will not be drastic. Soak the coral gravel in reverse osmosis water for a few days to remove any phosphate from the material. The water should be changed a few times during this time. It is necessary to keep these levels and salinity stable at all times if you want to successfully keep SPS corals. Fast and drastic changes will always have a negative effect on your animals.

Maintaining proper magnesium and calcium levels with only crushed coral media in a calcium reactor can be difficult at times. Synthetic salt mixes lack the right amounts of these two elements many times. Because of that, we offer special granulates (ZEOmag and ZEOca) to ensure sufficient levels of these elements. Both granulates should be mixed with the coral gravel media at a rate of approximately 10% (depending on tank requirements) before filling it into the calcium reactor. Tests have shown this "gentle" and effective method to be sufficient in providing these two elements. We recommend this method of element additions over the dosing with chlorides. Especially sensitive corals, such as Acropora suharsonoi, can be susceptible to tissue loss with additions of chlorides. The amount to be used of these granulates vary with the amount of corals and therefore is dependent on the stocking. Reduce of raise the amount based on your test results to find the „optimum" level. Please proceed with care in order to avoid high levels of these elements. Both granulates are very effective.

The suitability of natural coral sand for this purpose can vary greatly depending on the point of origin. We recommend testing your material for PO4 by soaking it in RO/DI water for several days. This water can now be tested for PO4. We recommend not using highly polluted coral sand. However, you can always use some kind of phosphate absorber for your calcium reactor effluent. These products can also be used in tanks not employing the ZEOvit® method.

At this point, we would like to offer our advice regarding exaggerated responses to "measurable" problems. Many times, it is a test error or the result of expired or inappropriately stored test kits. We recommend another test before taking any corrective measures.

Recent studies have shown that some of the results of test kits used in this hobby can differ greatly from the true values. It is very beneficial to use real salt water (from where the corals originated) for calibration to measure KH, Ca, Mg, K+ and salinity. This will ensure that the measurable values are at least close to the natural conditions.

In order to avoid any losses, please stick to the recommendations. Changes in salinity should be conducted very slowly and we recommend not exceeding weekly changes of max. 1 0/00. The easiest way to increase the salinity is the addition of salt to the top-off water. This will ensure a slow and steady increase of salinity.

Reefer'sBest Salt

The success of of keeping SPS corals greatly depends on the quality of the salt with the proper balance of elements. Our experience has shown that not every salt offered meets these criteria. The Reefer's Best Salt is produced with utmost care, using only the highest quality chemicals following the German and European pharmacy dispensary standards. The salt dissolves completely within 10 minutes at a temperature of about 15-25 degrees Celsius if it is mixed with a strong pump. The balanced levels of the salt make it possible to reduce water changes to 5% every two weeks.

11. Regular weekly water changes

To get a balanced addition of elements contained in the salt mixes, we recommend a weekly water change with the quantity depending on the amount of corals. Lightly or normal stocked tanks should get a 5 – 6% weekly water change with a good salt mix. For heavy stocked tanks, we recommend a weekly change of 10%, unless you use our "Reefer's Best" saltmix (5% every two weeks even in heavily stocked tanks is enough). Please make sure not to raise or lower the salinity of the tank. The reason for this water change is not to export nutrients but to provide a balanced addition of elements necessary for the corals.

Depending on the age of the tank and the accumulation of nutrients and elements, it may take 3-12 months for this system to show success. Our longest conversion took 11 months in a tank that had been established for 15 years. This change was done slowly and carefully without any loss of corals. Subsequently, success will occur fast and can be maintained if the above-mentioned points are followed.

Patience, care, observation and the ability to control dosing of elements are the safest requirements besides the "standard" technical equipment for this system to be successful.

Keeping clams, leather and soft corals, as well as LPS corals with this system is simple as you can see in our tanks that have been established for years.

12. Sufficient Water flow

Sufficent water flow is another very important factor for a successful reef aquarium. We recommend approximately 10 – 20 times the water volume per hour. Please make sure that there are no areas with insufficient flow anywhere in the tank. Coral growth may hinder the flow after years and increased water flow may be required. Corals require flow to facilitate shedding (soft corals) and detritus may not be allowed to settle on their surface as it could lead to tissue damage. Very good flow can be achieved with Tunze Stream pumps which generate strong but gentle flow.

13. Use of Live Rock

We recommend using the system from the start in tanks already stocked with live rock to shorten the initial cycle. Our experience has shown that it is possible to introduce corals within 2 - 4 weeks without any negative effects as long as all the other conditions are appropriate. Always use fresh live rock if possible (best if directly from the import

box). The fresher the live rock the better. We recommend against using old or foul live rock as well as dead or artificial rock. This could increase the cycling time drastically and potentially introduce harmful substances. We recommend soaking reef ceramics for at least 3 months before introducing them into a system. Please keep in mind; tanks can be extremely instable during the initial cycle because the necessary bacterial balance is not established. We recommend interfering as little as possible during this phase.

In addition, we recommend the use of some kind of bottom substrate. Our experience has shown that aragonite or coral sand (2 – 4 mm grain size) works the best. You should soak the material in RO water for a period of 2 weeks before use primarily to release bound phosphates. Change the water in this soaking container every two days until there is no measurable PO4. We recommend a substrate depth of about 1 – 1.5 inches. The biological system stability can be increased with this kind of substrate. We recommend against the use of pre-packaged live sand as there have been reports of problems from several users and from experience in our own system.

Please feel free to contact us directly should you still have questions or problems. International support can be found online at www.ZEOvit.com, at our US partner www.ZEOvitUSA.com or directly from our homepage at www.Korallen-zucht.de.

All of our products are made exclusively by us and are not distributed by any other company or under any other names. The development of the system is based on practical tests and users experiences. All products are made in Coburg.
We emphasize the optimization of the system with a complete product palette making ZEOvit® unique in the world.