



## Zoo Vienna relies on modern density measuring technology for the seawater aquariums

### Relevant for:

Seawater analysis



**The oldest zoo in the world has over 1.6 million visitors a year, making it the most popular attraction in Vienna. A wide variety of animal houses transport the visitor to foreign climates. The aquarium allows observers to experience life beneath the waves.**

Dr. Wolff and his team of experts have created the conditions required for complex water worlds to thrive in the aquarium. This requires skill and resources. The large reef aquarium, for example, contains ten tons of living rock. Soft and hard coral, different anemones and around 200 other species have their home within this ecosystem. Every hour around 130,000 liters of seawater are pumped through biological filters and skimmers, cleaned and returned to the aquarium. To present this magnificent world at its best requires a further 21 seawater tanks, large pumps, filter units and state-of-the-art measuring technology.

Here, the portable density meter DMA 35N from Anton Paar GmbH was tested for its suitability for aquariums.

This instrument measures the density of seawater to an accuracy of  $0.001 \text{ g/cm}^3$ , calculates the salt content and displays the water temperature – all within minutes.

*Dr. Wolff, how do you ensure optimal living conditions in these complex seawater aquariums?*

An aquarist must develop an eye and an instinct for the overall state of the animals and plants in the aquarium. Even when we determine all 12 standard seawater parameters, there are many more factors to be considered which cannot even be measured, not to mention the innumerable interactions which make up the essence of life in a reef. We check, measure and test systematically. This reveals any unwanted developments and allows us to start countermeasures in time. Measurements also help the curator develop an even better feeling for the many processes taking place in the aquarium.

*Can you give us practical examples, Dr. Wolff?*

Yes. For example: The seawater aquariums behave very differently according to the water temperature and the season. They lose water due to evaporation or gain water due to condensation. Even when the reef aquarium is set to  $25 \text{ }^\circ\text{C}$  ( $77 \text{ }^\circ\text{F}$ ) some areas can reach up to  $28 \text{ }^\circ\text{C}$  ( $82 \text{ }^\circ\text{F}$ ) due to the bright lighting. In these warmer areas, the water evaporates more quickly and the salt content rises.

The opposite is true for the Mediterranean aquariums. Their water temperature in the middle of summer is considerably lower than the ambient temperature. If humid summer air is pumped into the aquarium, the air humidity begins to condense into the water. The aquarium water becomes diluted and the salt content can sink to a critical level.

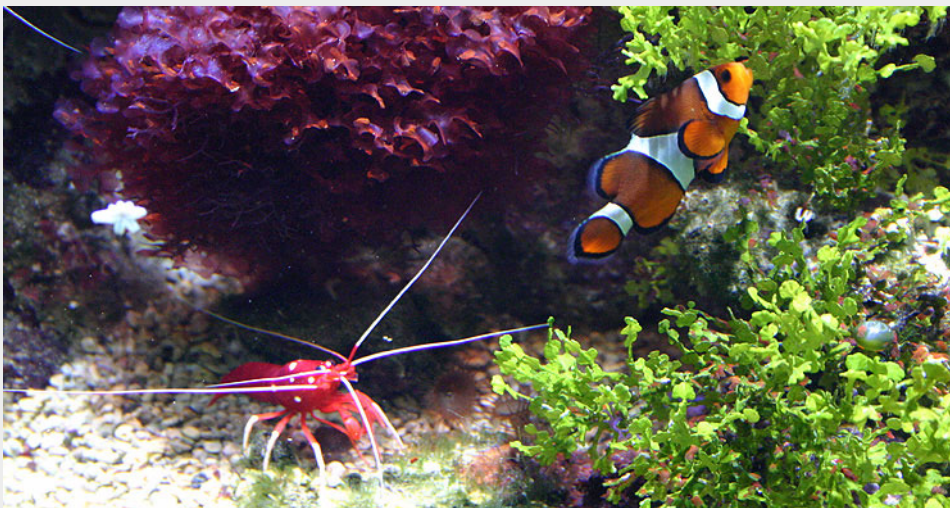
*Which parameters are measured in the seawater aquariums?*

We regularly determine temperature, density, salt content and metabolic end products such as ammonium/ammonia, pH value, nitrite and nitrate. Occasionally we measure the oxygen content and we can also measure phosphate, sulfate, carbonate hardness, calcium and magnesium, if required.

*Are some of these measuring properties more important than others?*

The density value is the most important parameter for monitoring seawater aquariums. When the density value moves outside the normal range, we have a critical situation on our hands. Fish can adapt to different salt contents relatively quickly. Invertebrates, such as corals, crabs, sea urchins and sea cucumbers, cannot. As their mucous membrane surfaces are exposed they cannot adapt osmotically to fluctuations in the salt content.

*Dr. Wolff, how often are the density and salt content measured?*





We check the density value once a day, more often when establishing a new aquarium or when new animals arrive and need to be adapted to a new environment. This adaptation process can take up to six hours with invertebrates.

If we know the difference between the density of the transport water and the density of the aquarium water we can plan the optimal adjustment times. Using the digital density meter means newly arrived animals can be adapted to their aquariums more quickly and more precisely. It is also a big advantage that the density measurement can be carried out with a sample volume of just 3 mL and that each measurement simultaneously determines the water temperature.

*What is your assessment of the suitability of this instrument for aquariums?*

The technical construction of the DMA 35N indicates a long working life. It is completely resistant to seawater and the measuring accuracy is more than sufficient. Other measuring principles, such as conductance measurement or refraction, have large fluctuations. In the aquarium water there are too many substances which influence these results.

*Thank you for the interview!*

We spoke to:

**Dr. Ekkehard Wolff**

Head of the Zoological Departments for Aquariums and Terrariums in Schönbrunn (Zoo Vienna).

Résumé:

- Ekkehard Wolff studied Zoology at the University of Basel.
- Ekkehard Wolff studied Zoology at the University of Basel.
- He is a specialist in sewage ecology and filter technology.

- Dr. Wolff started his career as curator for the vivarium at Basel Zoo, then became a scientific assistant at the Löbbeke Museum and the Aquazoo in Düsseldorf, followed by a position as curator at Hellabrunn Zoo in Munich. He has been at Zoo Vienna since March 1, 1998.

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