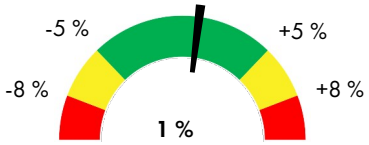
# REEF ICP **TOTAL**

**Methodology:** ICP-OES, photometric and electrochemical methods specific for seawater. Further methods possible via upgrades.

Recommended values are optimized for coral reef aquariums.

| | |
|---|---|
| **Sample ID:** | **20827489** |
| **Analysis ID:** | **338720** |
| **Booked upgrades:** | **non** |
| Sampling Point: | 180 gallon |
| Volume in Liters: | 1325 |
| Sampling Date: | 11-07-2026 |
| Sample Arrival: | 11-17-2026 |

Ion balance of the analysis




Slight cation excess / anion deficiency

Plausibility check of measured values passed

To the dosing and action recommendations

## PHYSICAL-CHEMICAL BASIC VALUES

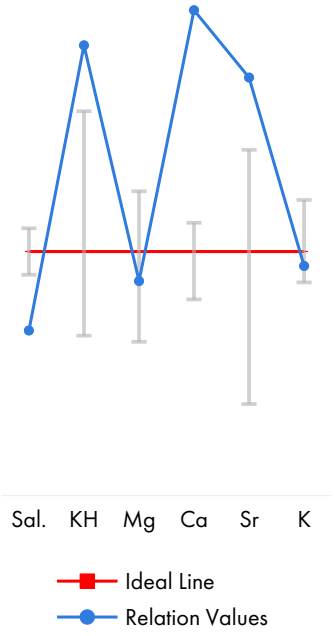
| | measured | Reference Range |
|---|---|---|
| **Electrical Conductivity** (mS/cm 25°C) | **48,4** | 51,7 - **53,0** - 54,5 |
| **Density** (kg/Liter, calculated 25°C) | **1,0207** | 1,022 - **1,023** - 1,024 |
| **Relative Density** (calculated 25°C) | **1,0238** | 1,026 - 1,027 |
| **Salinity** (psu, calculated) | **31,6** | 34 - **35** - 36 |
| **pH Value** | **7,92** | 7,9 - **8,3** - 8,4 |
| **Alkalinity** (°dKH) | **9,4** | 6,5 - **7,3** - 8,5 |
| **CO2 Content** (mg/l) | **1,29** | 0,04 - 2,5 |
| **Alkalinity pH 4.3** (mmol/L) | **3,36** | 2,3 - **2,58** - 3,0 |
| **Smell** | **none** | none |
| **Color** | **colorless** | colorless |

## MACROELEMENTS, CALCIUM BALANCE ELEMENTS AND HALOGENS in mg/Liter

| | | measured | Reference Range | rel. 35 psu |
|---|---|---|---|---|
| **Sodium** | Na | **9915** | 9500 - **10700** - 11500 | **10999** |
| **Sulfur** | S | **854** | 850 - **900** - 950 | **947** |
| **Sulfate** | $SO_4^{2-}$ | **2559** | 2550 - **2700** - 2850 | **2838** |
| **Potassium** | K | **388** | 380 - **395** - 420 | **430** |
| **Boron** | B | **4,9** | 3,8 - **4,5** - 5,5 | **5,44** |
| **Magnesium** | Mg | **1301** | 1200 - **1350** - 1450 | **1443** |
| **Calcium** | Ca | **551** | 400 - **425** - 440 | **611** |
| **Strontium** | Sr | **9,71** | 6,5 - **8,0** - 9,0 | **10,77** |
| **Chloride** | $Cl^-$ | **17956** | 18700 - **19500** - 20300 | **19919** |
| **Bromine** (total bromine, ICP-OES) | Br | **82,2** | 55 - **67** - 75 | **91,2** |
| **Fluoride** | $F^-$ | **0,75** | 0,9 - **1,3** - 1,6 | **0,83** |
| **Iodine** (Total Iodine, ICP-OES) | I | **0,12** | 0,055 - **0,065** - 0,080 | **0,133** |

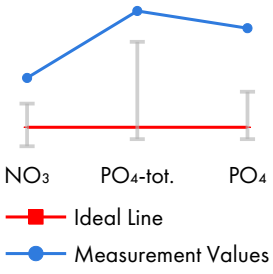
## RELATION VALUES OF MACROELEMENTS AND HALOGENS

| | | measured | Reference Range |
|---|---|---|---|
| **Salinity Meas. : Target Value** | Sal. | **0,9** | 0,97 - **1,00** - 1,03 |
| **KH Measurement : Target Value** | KH | **1,3** | 0,90 - **1,00** - 1,17 |
| **Magnesium : Salinity** | Mg | **41,2** | 33,3 - **38,6** - 42,6 |
| **Calcium : Salinity** | Ca | **17,5** | 11,1 - **12,1** - 12,9 |
| **Strontium: Salinity** | Sr | **0,31** | 0,18 - **0,23** - 0,26 |
| **Potassium : Salinity** | K | **12,3** | 10,6 - **11,3** - 12,4 |
| **Boron : Salinity** | B | **0,16** | 0,11 - **0,13** - 0,16 |
| **Chloride : Salinity** | $Cl^-$ | **569** | 519 - **557** - 597 |
| **Sulfate : Salinity** | $SO_4^{2-}$ | **81,1** | 71 - **77** - 84 |
| **Chloride : Sulfate** | $Cl^-/SO_4^{2-}$ | **7,02** | 6,6 - **7,2** - 8,0 |
| **Magnesium : Calcium** | Mg/Ca | **2,36** | 2,7 - **3,2** - 3,6 |
| **Calcium : Strontium** | Ca/Sr | **56,7** | 44 - **53** - 68 |
| **Bromine : Fluoride** | $Br^-/F^-$ | **109,6** | 34 - **52** - 83 |
| **Fluoride : Iodine** | $F^-/I$ | **6,2** | 11 - **20** - 29 |
| **Fluoride : Sulfur : Strontium** | FSS | **81,9** | 80 - **100** - 120 |




## MACRO NUTRIENTS in mg/Liter

| | | measured | Reference Range |
|---|---|---|---|
| **Nitrate** | $NO_3^-$ | **15,4** | 1 - 10 |
| **Nitrite** | $NO_2^-$ | **0,03** | n.d. - 0,15 |
| **Phosphorus** (ICP-OES) | P | **0,077** | 0,006 - 0,060 |
| **Total Phosphate** (calculated) | $PO_4^{3-}{}_{tot.}$ | **0,236** | 0,02 - 0,18 |
| **ortho-Phosphate** (photometric) | $PO_4^{3-}$ | **0,207** | 0,02 - 0,10 |
| **Silicon** | Si | **0,14** | 0,1 - 0,2 |
| **Silicate** (calculated) | $SiO_2$ | **0,29** | 0,2 - 0,4 |

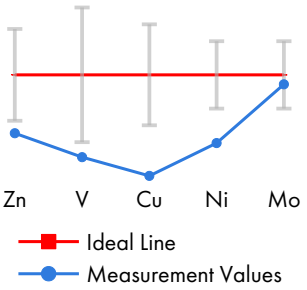



## ORGANIC FACTORS

| | | measured | Reference Range |
|---|---|---|---|
| **Nitrate : ortho-Phosphate** | $NO_3^-/PO_4^{3-}$ | **74,64** | 90 - 110 |
| **Total Phosphate : ortho-Phosphate** | $PO_4^{3-}{}_{tot.}/PO_4^{3-}$ | **1,14** | **1,00** |
| **Total Phosphate : Iodine** | $PO_4^{3-}/I$ | **1,97** | 0,13 - 1,67 |
| **SAK254** ($m^{-1}$) | | **not measured** | only with SAK254 upgrade |
| **NPOC** (mg/l) | C | **not measured** | only with organic upgrade |
| **TNb** (mg/l) | N | **not measured** | only with organic upgrade |

## Dynamic Elements in µg/Liter

| | | measured | Reference Range |
|---|---|---|---|
| **Zinc** | Zn | **2,32** | 3 - 5,5 - 8 |
| **Vanadium** | V | **1,11** | 2 - 6 - 10 |
| **Copper** | Cu | **n.d.** | 2 - 4 - 6 |
| **Nickel** | Ni | **1,46** | 3 - 4,5 - 6 |
| **Molybdenum** | Mo | **13,6** | 10 - 15 - 20 |

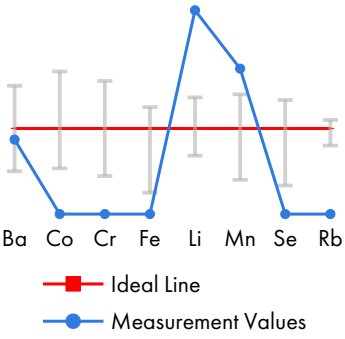



## PHYSIOLOGICALLY RELEVANT TRACE ELEMENTS in µg/Liter

| | | | measured | Reference Range |
|---|---|---|---|---|
| **Barium** | Ba | | **8,7** | 5 - max. 50 |
| **Cobalt** | Co | | **n.d.** | n.d. - max. 1,9 |
| **Chromium** | Cr | | **n.d.** | n.d. - max. 2,3 |
| **Iron** | Fe | | **n.d.** | n.d. - max. 2,5 |
| **Lithium** | Li | * | **524** | 180 - max. 350 |
| **Manganese** | Mn | | **0,17** | n.d. - max. 0,25 |
| **Selenium** | Se | | **n.d.** | n.d. - max. 2,0 |

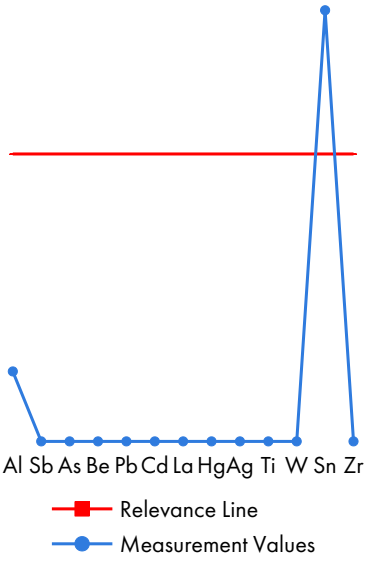
only with ICP-MS upgrade:

| | | |
|---|---|---|
| **Rubidium** | Rb | **not measured** |



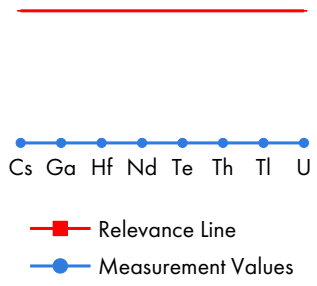

## OTHER TRACE ELEMENTS AND POTENTIAL POLLUTANTS in µg/Liter

| | | measured | Reference Range |
|---|---|---|---|
| **Aluminum** | Al | **7,3** | 5 - 30 |
| **Antimony** | Sb | **n.d.** | n.d. - max. 10 |
| **Arsenic** | As | **n.d.** | **n.d.** |
| **Beryllium** | Be | **n.d.** | **n.d.** |
| **Lead** | Pb | **n.d.** | **n.d.** |
| **Cadmium** | Cd | **n.d.** | **n.d.** |
| **Lanthanum** | La | **n.d.** | 2 - 10 |
| **Mercury** | Hg | **n.d.** | **n.d.** |
| **Silver** | Ag | **n.d.** | n.d. - max. 10 |
| **Titanium** | Ti | **n.d.** | n.d. - 3,5 |
| **Tungsten** | W | **n.d.** | n.d. - max. 30 |
| **Tin** | Sn | **7,5** | n.d. - max. 10 |
| **Zirconium** | Zr | **n.d.** | n.d. - 2,2 |




only with ICP-MS upgrade:

| | | |
|---|---|---|
| **Cesium** | Cs | **not measured** |
| **Gallium** | Ga | **not measured** |
| **Hafnium** | Hf | **not measured** |
| **Neodymium** | Nd | **not measured** |
| **Tellurium** | Te | **not measured** |
| **Thorium** | Th | **not measured** |
| **Thallium** | Tl | **not measured** |
| **Uranium** | U | **not measured** |



## OSMOSIS WATER

| in mg/Liter | | | measured | Reference Range |
|---|---|---|---|---|
| **Boron** | B | | **n.d.** | **n.d.** |
| **Calcium** | Ca | | **4** | **n.d.** |
| **Potassium** | K | | **3** | **n.d.** |
| **Magnesium** | Mg | | **9,4** | **n.d.** |
| **Sodium** | Na | * | **75,7** | **n.d.** |
| **Sulfur** | S | | **5,4** | **n.d.** |
| **Bromine** (total bromine, ICP-OES) | Br | | **n.d.** | **n.d.** |
| **Iodine** (Total Iodine, ICP-OES) | I | | **n.d.** | **n.d.** |
| **Phosphorus** (ICP-OES) | P | | **n.d.** | **n.d.** |
| **Total Phosphate** (calculated) | $PO_4^{3-}$ tot. | | **n.d.** | **n.d.** |
| **Silicon** | Si | | **n.d.** | **n.d.** |
| **Silicate** (calculated) | $SiO_2$ | | **n.d.** | **n.d.** |
| in µg/Liter | | | | |
| **Barium** | Ba | | **1,3** | **n.d.** |
| **Copper** | Cu | | **n.d.** | **n.d.** |
| **Iron** | Fe | | **n.d.** | **n.d.** |
| **Lithium** | Li | | **1,42** | **n.d.** |
| **Nickel** | Ni | | **n.d.** | **n.d.** |
| **Zinc** | Zn | | **4,45** | **n.d.** |
| **Aluminum** | Al | | **n.d.** | **n.d.** |
| **Antimony** | Sb | | **n.d.** | **n.d.** |
| **Arsenic** | As | | **n.d.** | **n.d.** |
| **Beryllium** | Be | | **n.d.** | **n.d.** |
| **Lead** | Pb | | **n.d.** | **n.d.** |
| **Cadmium** | Cd | | **n.d.** | **n.d.** |
| **Chromium** | Cr | | **n.d.** | **n.d.** |
| **Cobalt** | Co | | **n.d.** | **n.d.** |
| **Lanthanum** | La | | **n.d.** | **n.d.** |
| **Manganese** | Mn | | **n.d.** | **n.d.** |
| **Molybdenum** | Mo | | **n.d.** | **n.d.** |
| **Mercury** | Hg | | **n.d.** | **n.d.** |
| **Selenium** | Se | | **n.d.** | **n.d.** |
| **Silver** | Ag | | **n.d.** | **n.d.** |
| **Strontium** | Sr | | **61,7** | **n.d.** |
| **Titanium** | Ti | | **n.d.** | **n.d.** |
| **Thallium** | Tl | | **n.d.** | **n.d.** |
| **Vanadium** | V | | **n.d.** | **n.d.** |
| **Tungsten** | W | | **n.d.** | **n.d.** |
| **Tin** | Sn | | **n.d.** | **n.d.** |
| **Zirconium** | Zr | | **n.d.** | **n.d.** |

## Overview of dosages

| Product | Total quantity | spread over ... | corresponds | Priority | Checkbox |
|---|---|---|---|---|---|
| SALINITY | no need for action | | | | |
| ELEMENTALS S | No dosage | | | | |
| ELEMENTALS K | No dosage | | | | |
| ELEMENTALS B | No dosage | | | | |
| ELEMENTALS MG | No dosage | | | | |
| ELEMENTALS SR | No dosage | | | | |
| ELEMENTALS BR | No dosage | | | | |
| ELEMENTALS F | 364,4 ml | 2 days | 182,2 ml/day | 2 | ☐☐ |
| TRACE I | No dosage | | | | |
| ELEMENTALS N | No dosage | | | | |
| ELEMENTALS P | Water change | | | 2 | |
| TRACE ZN | 4,2 ml | 2 days | 2,1 ml/day | 3 | ☐☐ |
| TRACE V | 13,0 ml | 3 days | 4,3 ml/day | 3 | ☐☐☐ |
| TRACE CU | 53,0 ml | 2 days | 26,5 ml/day | 3 | ☐☐ |
| TRACE NI | 10,1 ml | 1 day | 10,1 ml/day | 3 | ☐ |
| TRACE MO | No dosage | | | | |
| TRACE BA | No dosage | | | | |
| TRACE CO | 3,1 ml | 1 day | 3,1 ml/day | 4 | ☐ |
| TRACE CR | 31,3 ml | 3 days | 10,4 ml/day | 4 | ☐☐☐ |
| TRACE FE | 4,1 ml | 2 days | 2,1 ml/day | 4 | ☐☐ |
| TRACE LI | No dosage | | | | |
| TRACE MN | No dosage | | | | |
| TRACE SE | 84,8 ml | 4 days | 21,2 ml/day | 4 | ☐☐☐☐ |
| TRACE RB | only with ICP-MS upgrade | | | | |

**Upgrade options for a Reef ICP Total:**

**ICP-MS upgrade:** Analysis of all trace elements (except aluminum and lithium) using ICP-MS with up to 1000x higher sensitivity than ICP-OES and analysis of exclusive elements. ICP-MS exclusive elements cannot be determined using ICP-OES, or at least not with sufficient sensitivity. Labeling of measured values determined using ICP-MS: MS

**Organic upgrade:** Determination of the concentrations of organic carbon (NPOC) and total nitrogen (TNb).

**SAK254 upgrade:** Determination of the indicator value for the concentration of unsaturated organic compounds.

**Detection limits**

Time-averaged detection limits for all relevant values are published regularly on lab.faunamarin.de.

**Abbreviations:**

ICP-OES (inductively coupled plasma with optical emission spectrometry), ICP-MS (inductively coupled plasma with mass spectrometry), SAK254 (spectral absorption coefficient at 254 nm), NPOC (not easily expelled organic carbon), TNb (total bound nitrogen), n.d. (not detectable).

* Measured value is too far outside the calibration range and cannot be precisely determined.