ICP Water Analysis Plus

Sample-ID: **TM6200000482**

Sample type:	**Seawater**
Aquarium volume in liters:	**606**
From your aquarium:	**LL 160**
Date of taking the water sample:	**11-21-2025**
Receipt of the sample	**12-01-2025**

Methodology: ICP-OES (inductively coupled plasma with optical emission spectrometry) and other methods specific for seawater; recommended values are optimized for coral reef aquariums.for coral reef aquariums.
Detailed information on the elements as well as specific recommendations for action and precise dosing instructions can be found at https://lab.tropic-marin.com/de/home/analysis/11140

Basic physical and chemical values

	meas. Value	Optimal range	Recommendation
Electrical conductivity (mS/cm 25°C)	**51.4**	49 - 53	Ideal
Density (kg/liter, calculated 25°C)	**1.0224**	1,022 - 1,023	Ideal
Relative density (calculated 25°C)	**1.0254**	1,024 - 1,026	lower
Salinity (psu, calculated)	**33.742**	32 - 35	Ideal
pH value	**8.06**	7,8 - 8,4	Ideal
Alkalinity (°dKH)	**9**	6,5 - 8,0	lower
CO_2-Content (mg/l)	**2.28**	0,04 - 2,50	Ideal
Acid binding capacity pH 4.3 (mmol/L)	**3.213**	2,32 - 2,85	lower
Odor	**none**	none	
Coloring	**none**	colorless	

Tropic Marin Block Analysis System

		meas. Value	Rel. 35 psu	Optimal range	Recommendation	Product recd.
Iodine (total iodine, ICP-OES) (mg/l)	I	**0.053**	**0.055**	0,05 - 0,09	Ideal	Block Iodine
Molybdenum (µg/l)	Mo	**34.7**	**35.99**	10 - 20	lower	Block Molybdenum
Nickel (µg/l)	Ni	**1.46**	**1.51**	3 - 6	increase	Block Nickel
Strontium (mg/l)	Sr	**11**	**11.41**	6,5 - 9,0	lower	Block Strontium
Zinc (µg/l)	Zn	**n.n.**	**n.n.**	3 - 8	increase	Block Zinc

Tropic Marin Block Analysis System
Tropic Marin has developed a system that can support ICP-OES analysis: We know that different elements are consumed in the aquarium in relation to each other. Changes in the concentration of a single element therefore result in proportionally equal changes in the concentration of the other elements in this group. If you know the requirement of an element, you can use this indicator element to calculate the consumption of several other elements. Defined indicator or lead elements can be analyzed very well using ICP-OES and have a very low tolerance range. Particularly in the case of seawater salts, which contain a large number of elements, it is more expedient to consider only special indicator elements (with low measurement tolerance) among the measured values of the ICP-OES and to include the elements with a very low concentration in a certain ratio. Concentration data with high measurement tolerances of the ICP-OES for elements that are difficult to determine can be neglected in this way without causing a deficiency in these elements. **Tropic Marin** has developed element mixtures from the above-mentioned element groups: the **Tropic Marin BAS Solutions** (BAS = Block Analysis System). Based on the lead elements, all other elements in the aquarium are (co-)dosed - even elements with very low natural concentrations, which may not be analyzed in the ICP-OES (as they are below the measuring limit).

Makroelements, lime household elements and halogens in mg/Liter (1 mg = 0,001 g)

		meas. Value	Rel. 35 psu	Optimal range	Recommendation	Product recd.
Chloride	Cl-	18677.38	19374	18000 - 19500	Ideal	
Sodium	Na	10321	10706	9400 - 11000	Ideal	
Sulfur	S	707	733	820 - 950	increase	Sulfur
Sulphate	SO42-	2118.172	2197	2470 - 2800	increase	
Potassium	K	458	475	380 - 420	lower	Potassium
Boron	B	6.36	6.6	3,8 - 5,5	lower	Boron
Magnesium	Mg	1445	1499	1200 - 1450	Ideal	Magnesium
Calcium	Ca	473	491	400 - 480	Ideal	Calcium
Strontium	Sr	11	11.41	6,5 - 9,0	lower	Strontium
Bromine	Br	53.3	55.3	55 - 75	increase	Bromine
Fluoride	F-	0.65	0.67	0,9 - 1,6	increase	Fluorine
Iodine (total iodine, ICP-OES)	I	0.053	0.055	0,05 - 0,09	Ideal	Iodine

Relative values of macroelements and halogens (relative factors)

		Relative value	Optimal range
Salinity meas. value : target value	Sal.	0.964	0,94 - 1,03
KH measured value : target value	KH	1.241	0,87 - 1,07
Magnesium : Salinity	Mg	42.825	33,3 - 42,6
Calcium : Salinity	Ca	14.018	11,1 - 12,9
Strontium: Salinity	Sr	0.326	0,18 - 0,26
Potassium : Salinity	K	13.57	10,6 - 12,4
Boron : Salinity	B	0.188	0,11 - 0,16
Chloride : Salinity	Cl-	553.541	519 - 597
Sulphate : Salinity	SO42-	62.7762	2,9 - 3,1
Chloride : Sulphate	Cl-/SO42	8.818	6,6 - 8,0
Magnesium : Calcium	Mg/Ca	3.055	2,7 - 3,6
Calcium : Strontium	Ca/Sr	43	44 - 68
Bromide : Fluoride	Br-/F-	82	34 - 83
Fluoride : Iodine	F-/I	12.264	11 - 29

Macronutrients in mg/Liter (1 mg = 0,001 g)

		meas. Value	Optimal range	Recommendation	Product recd.
Nitrate	NO3-	7.78	0,1 - 2,0	lower	Nitrogen
Nitrite	NO2-	0.09	0,0 - 0,2	Ideal	Nitrogen
Phosphorus (ICP-OES)	P	0.027	0,016 - 0,098	Ideal	Phosphate
Total phosphate (calculated)	PO43-tot	0.08278	0,05 - 0,30	Ideal	Phosphate
Orthophosphate (photometric)	PO43-	0.015	0,05 - 0,30	increase	Phosphate
Silicon	Si	0.206	0,1 - 0,2	lower	
Silicate (calculated)	SiO2	0.443	0,2996 - 0,5992	Ideal	

Relative values

Total phosphate : Nitrate	93.981783	2 - 20
Total phosphate : Ortho-phosphate	5.533	0,9 - 1,1
Total phosphate : Iodine	1.5619	0,8 - 5,0

Physiologically relevant trace substances and color-relevant micronutrients
In µg/Liter (1 µg = 0,000001 g)

		meas. Value	Optimal range	Recommendation	Product recd.
Zinc	Zn	n.n.	3 - 8	increase	Zinc
Vanadium	V	4.4	2 - 10	Ideal	Vanadium
Copper	Cu	2.63	2 - 6	Ideal	Copper
Nickel	Ni	1.46	3 - 6	increase	Nickel
Manganese	Mn	0.25	0,5 - 1,2	increase	Manganese
Molybdenum	Mo	34.7	10 - 20	lower	Molybdenum
Iron	Fe	0.23	0,05 - 0,60	Ideal	Iron
Chrome	Cr	0.76	0,05 - 2,30	Ideal	Chromium
Cobalt	Co	0.416	0,02 - 1,90	Ideal	Cobalt

Other trace elements and potential pollutants
in µg/Liter (1 µg = 0,000001 g)

		meas. Value	Optimal range	Recommendation	Product recd.
Lithium	Li	229	180 - 350	Ideal	Lithium
Barium	Ba	9.9	5 - 20	Ideal	Barium
Aluminium	Al	11.3	5 - 30	Ideal	
Antimony	Sb	n.n.	0 - 10	increase	
Tin	Sn	n.n.	0 - 10	increase	
Beryllium	Be	n.n.	0,1 - 1,4	increase	
Selenium	Se	n.n.	0,15 - 0,30	increase	
Silber	Ag	n.n.	0 - 10	increase	
Tungsten	W	n.n.	0 - 30	increase	
Lanthanum	La	n.n.	2 - 10	increase	
Titanium	Ti	n.n.	0,5 - 3,5	increase	
Zirconium	Zr	n.n.	1,0 - 2,2	increase	
Arsenic	As	n.n.	0 - 1	increase	
Cadmium	Cd	n.n.	0 - 1	increase	
Mercury	Hg	n.n.	0 - 1	increase	
Lead	Pb	n.n.	0 - 1	increase	

Osmosis water in mg/Liter (1 mg = 0,001 g)

		meas. Value	Optimal range
Calcium	Ca	**n.n.**	n.n.
Potassium	K	**n.n.**	n.n.
Magnesium	Mg	**n.n.**	n.n.
Sodium	Na	**n.n.**	n.n.
Sulphur	S	**n.n.**	n.n.
Phosphorus (ICP-OES)	P	**n.n.**	n.n.
Total phosphate (calculated)	$PO_4^{3-}{}_{tot.}$	**n.n.**	n.n.
Silicon	Si	**0.01**	n.n.
Silicate (calculated)	SiO_2	**0.03**	n.n.

Osmosis water in µg/Liter (1 µg = 0,000001 g)

		meas. Value	Optimal range
Aluminium	Al	**n.n.**	n.n.
Lead	Pb	**n.n.**	n.n.
Cadmium	Cd	**n.n.**	n.n.
Chrome	Cr	**n.n.**	n.n.
Iron	Fe	**n.n.**	n.n.
Copper	Cu	**n.n.**	n.n.
Lithium	Li	**n.n.**	n.n.
Nickel	Ni	**n.n.**	n.n.
Mercury	Hg	**n.n.**	n.n.
Tin	Sn	**n.n.**	n.n.
Zinc	Zn	**34.9**	n.n.

Measured values of the type “> 24” indicate that the concentration is above the calibrated range and therefore cannot be definitively determined. In these cases, the minimum amount present is indicated (e.g. 24 µg/l). Abbreviations: n.g. (not measured), n.n. (not detectable).