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:	**20821500**
Analysis ID:	**238597**
Booked upgrades:	**non**
Sampling Point:	Aquarium 1
Volume in Liters:	0
Sampling Date:	08-05-2025
Sample Arrival:	08-20-2025

To the dosing and action recommendations



PHYSICAL-CHEMICAL BASIC VALUES

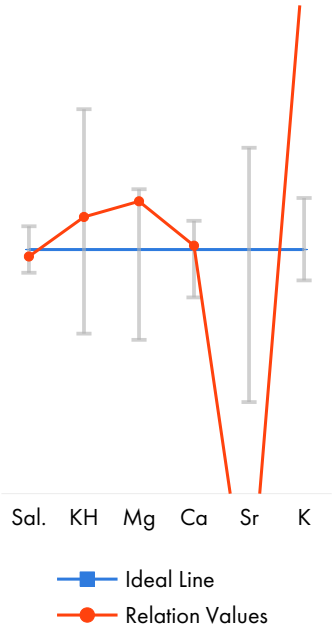
	measured	Reference Range
Electrical Conductivity (mS/cm 25°C)	**52,7**	51,7 - **53,0** - 54,5
Density (kg/Liter, calculated 25°C)	**1,023**	1,022 - **1,023** - 1,024
Relative Density (calculated 25°C)	**1,026**	1,026 - 1,027
Salinity (psu, calculated)	**34,7**	34 - **35** - 36
pH Value	**7,59**	7,9 - **8,3** - 8,4
Carbonate Hardness (°dKH)	**7,8**	6,5 - **7,3** - 8,5
CO2 Content (mg/l)	**5,82**	0,04 - 2,5
Alkalinity pH 4.3 (mmol/L)	**2,78**	2,3 - **2,58** - 3,0
Smell	**none**	none
Color	**none**	colorless

MACROELEMENTS, CALCIUM BALANCE ELEMENTS, AND HALOGENS in mg/Lit

			measured	Reference Range	rel. 35 psu
Sodium	Na		**11066**	9500 - **10700** - 11500	**11162**
Sulfur	S		**812**	850 - **900** - 950	**819**
Sulfate	SO_4^{2-}		**2433**	2550 - **2700** - 2850	**2454**
Potassium	K		**539**	380 - **395** - 420	**544**
Boron	B		**6,16**	3,8 - **4,5** - 5,5	**6,21**
Magnesium	Mg		**1430**	1200 - **1350** - 1450	**1442**
Calcium	Ca		**427**	400 - **425** - 440	**431**
Strontium	Sr		**4,33**	6,5 - **8,0** - 9,0	**4,37**
Chloride	Cl^-		**19016**	18700 - **19500** - 20300	**19182**
Bromine (total bromine, ICP-OES)	Br		**57,6**	55 - **67** - 75	**58,1**
Fluoride	F^-		**0,25**	0,9 - **1,3** - 1,6	**0,25**
Iodine (Total Iodine, ICP-OES)	I	*	**0,189**	0,055 - **0,065** - 0,080	**0,191**

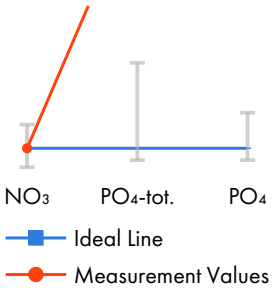
RELATION VALUES OF MACROELEMENTS AND HALOGENS

		measured	Reference Range
Salinity Meas. : Target Value	Sal.	**0,99**	0,97 - **1,00** - 1,03
KH Measurement : Target Value	KH	**1,08**	0,90 - **1,00** - 1,17
Magnesium : Salinity	Mg	**41,2**	33,3 - **38,6** - 42,6
Calcium : Salinity	Ca	**12,3**	11,1 - **12,1** - 12,9
Strontium: Salinity	Sr	**0,12**	0,18 - **0,23** - 0,26
Potassium : Salinity	K	**15,5**	10,6 - **11,3** - 12,4
Boron : Salinity	B	**0,18**	0,11 - **0,13** - 0,16
Chloride : Salinity	Cl^-	**548**	519 - **557** - 597
Sulfate : Salinity	SO_4^{2-}	**70,1**	71 - **77** - 84
Chloride : Sulfate	Cl^-/SO_4^{2-}	**7,82**	6,6 - **7,2** - 8,0
Magnesium : Calcium	Mg/Ca	**3,35**	2,7 - **3,2** - 3,6
Calcium : Strontium	Ca/Sr	**98,6**	44 - **53** - 68
Bromide : Fluoride	Br^-/F^-	**230,4**	34 - **52** - 83
Fluoride : Iodine	F^-/I	**1,3**	11 - **20** - 29
Fluoride : Sulfur : Strontium	FSS	**50,1**	80 - **100** - 120



MACRO NUTRIENTS in mg/Liter

		measured	Reference Range
Nitrate	NO_3^-	**5**	1 - 10
Nitrite	NO_2^-	**0,08**	n.d. - 0,15
Phosphorus (ICP-OES)	P	**0,154**	0,006 - 0,060
Total Phosphate (calculated)	$PO_4^{3-}{}_{tot.}$	**0,472**	0,02 - 0,18
ortho-Phosphate (photometric)	PO_4^{3-}	**0,465**	0,02 - 0,10
Silicon	Si	**0,45**	0,1 - 0,2
Silicate (calculated)	SiO_2	**0,97**	0,2 - 0,4

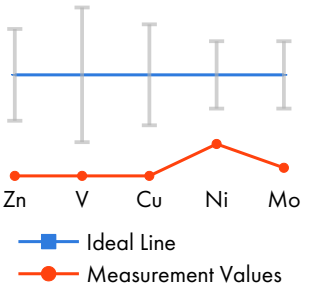


ORGANIC FACTORS

		measured	Reference Range	
Total Phosphate : Nitrate	$PO_4^{3-}{}_{tot.}/NO_3^-$	**10,61**	90 - 110	
Total Phosphate : ortho-Phosphate	$PO_4^{3-}{}_{tot.}/PO_4^{3-}$	**1,015**	**1,00**	
Total Phosphate : Iodine	$PO_4^{3-}{}_{tot.}/I$	**2,5**	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	**n.d.**	3	- 5,5 -	8
Vanadium	V	**n.d.**	2	- 6 -	10
Copper	Cu	**n.d.**	2	- 4 -	6
Nickel	Ni	**1,42**	3	- 4,5 -	6
Molybdenum	Mo	**1,2**	10	- 15 -	20

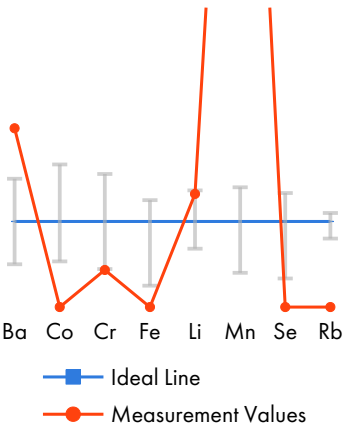


PHYSIOLOGICALLY RELEVANT TRACE ELEMENTS in µg/Liter

		measured	Reference Range		
Barium	Ba	**20,9**	5	- max.	50
Cobalt	Co	**n.d.**	n.d.	- max.	1,9
Chromium	Cr	**0,78**	n.d.	- max.	2,3
Iron	Fe	**n.d.**	n.d.	- max.	2,5
Lithium	Li	**291**	180	- max.	350
Manganese	Mn	**1,02**	n.d.	- max.	0,25
Selenium	Se	**n.d.**	n.d.	- max.	2,0

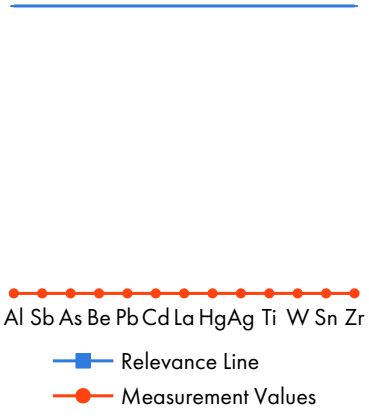
only with ICP-MS upgrade:

Rubidium	Rb	**not measured**			



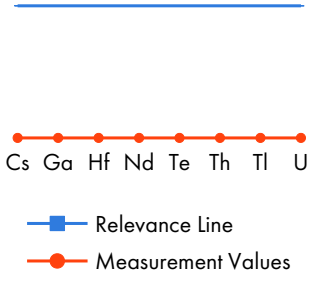
OTHER TRACE ELEMENTS AND POTENTIAL POLLUTANTS in µg/Liter

		measured	Reference Range		
Aluminum	Al	**n.d.**	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	**n.d.**	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		**0,31**	**n.d.**
Calcium	Ca		**n.d.**	**n.d.**
Potassium	K		**n.d.**	**n.d.**
Magnesium	Mg		**n.d.**	**n.d.**
Sodium	Na		**0,7**	**n.d.**
Sulfur	S		**n.d.**	**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	*	**0,94**	**n.d.**
Silicate (calculated)	SiO_2		**2,01**	**n.d.**
in µg/Liter				
Barium	Ba		**4,84**	**n.d.**
Copper	Cu		**n.d.**	**n.d.**
Iron	Fe		**n.d.**	**n.d.**
Lithium	Li		**n.d.**	**n.d.**
Nickel	Ni		**n.d.**	**n.d.**
Zinc	Zn		**n.d.**	**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		**n.d.**	**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	Water change			1	
ELEMENTALS B	Water change			1	
ELEMENTALS MG	No dosage				
ELEMENTALS SR	No dosage				
ELEMENTALS BR	No dosage				
ELEMENTALS F	No dosage				
TRACE I	Water change			2	
ELEMENTALS P	Water change			2	
TRACE ZN	No dosage				
TRACE V	No dosage				
TRACE CU	No dosage				
TRACE NI	No dosage				
TRACE MO	No dosage				
TRACE BA	No dosage				
TRACE CO	No dosage				
TRACE CR	No dosage				
TRACE FE	No dosage				
TRACE LI	No dosage				
TRACE MN	Water change			4	
TRACE SE	No dosage				
TRACE RB	No dosage				

Upgrade options for a Reef ICP Total:

ICP-MS upgrade: Analysis of all trace elements (except aluminum and lithium) by ICP-MS with up to 1000x higher sensitivity compared to ICP-OES and analysis of exclusive elements. ICP-MS exclusive elements cannot be determined by ICP-OES, or not with sufficient sensitivity.

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.