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:	**20853617**
Analysis ID:	**247134**
Booked upgrades:	**non**
Sampling Point:	180 gallon
Volume in Liters:	1325
Sampling Date:	09-19-2025
Sample Arrival:	10-01-2025

To the dosing and action recommendations



PHYSICAL-CHEMICAL BASIC VALUES

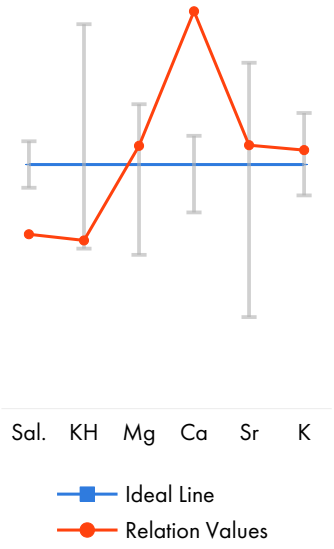
	measured	Reference Range
Electrical Conductivity (mS/cm 25°C)	**49**	51,7 - **53,0** - 54,5
Density (kg/Liter, calculated 25°C)	**1,021**	1,022 - **1,023** - 1,024
Relative Density (calculated 25°C)	**1,024**	1,026 - 1,027
Salinity (psu, calculated)	**32**	34 - **35** - 36
pH Value	**8,04**	7,9 - **8,3** - 8,4
Carbonate Hardness (°dKH)	**6,8**	6,5 - **7,3** - 8,5
CO2 Content (mg/l)	**1,8**	0,04 - 2,5
Alkalinity pH 4.3 (mmol/L)	**2,43**	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		**9892**	9500 - **10700** - 11500	**10824**
Sulfur	S		**841**	850 - **900** - 950	**920**
Sulfate	SO_4^{2-}		**2520**	2550 - **2700** - 2850	**2757**
Potassium	K		**402**	380 - **395** - 420	**440**
Boron	B		**4,96**	3,8 - **4,5** - 5,5	**5,43**
Magnesium	Mg		**1381**	1200 - **1350** - 1450	**1511**
Calcium	Ca		**505**	400 - **425** - 440	**553**
Strontium	Sr		**8,19**	6,5 - **8,0** - 9,0	**8,96**
Chloride	Cl^-		**17881**	18700 - **19500** - 20300	**19566**
Bromine (total bromine, ICP-OES)	Br		**89**	55 - **67** - 75	**97,4**
Fluoride	F^-		**0,61**	0,9 - **1,3** - 1,6	**0,67**
Iodine (Total Iodine, ICP-OES)	I	*	**0,389**	0,055 - **0,065** - 0,080	**0,426**

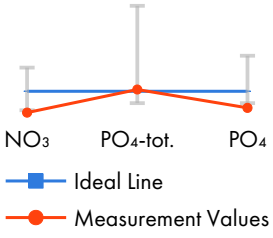
RELATION VALUES OF MACROELEMENTS AND HALOGENS

		measured	Reference Range
Salinity Meas. : Target Value	Sal.	**0,91**	0,97 - **1,00** - 1,03
KH Measurement : Target Value	KH	**0,94**	0,90 - **1,00** - 1,17
Magnesium : Salinity	Mg	**43,2**	33,3 - **38,6** - 42,6
Calcium : Salinity	Ca	**15,8**	11,1 - **12,1** - 12,9
Strontium: Salinity	Sr	**0,26**	0,18 - **0,23** - 0,26
Potassium : Salinity	K	**12,6**	10,6 - **11,3** - 12,4
Boron : Salinity	B	**0,16**	0,11 - **0,13** - 0,16
Chloride : Salinity	Cl^-	**559**	519 - **557** - 597
Sulfate : Salinity	SO_4^{2-}	**78,8**	71 - **77** - 84
Chloride : Sulfate	Cl^-/SO_4^{2-}	**7,1**	6,6 - **7,2** - 8,0
Magnesium : Calcium	Mg/Ca	**2,73**	2,7 - **3,2** - 3,6
Calcium : Strontium	Ca/Sr	**61,7**	44 - **53** - 68
Bromine : Fluoride	Br^-/F^-	**145,9**	34 - **52** - 83
Fluoride : Iodine	F^-/I	**1,6**	11 - **20** - 29
Fluoride : Sulfur : Strontium	FSS	**72,9**	80 - **100** - 120



MACRO NUTRIENTS in mg/Liter

		measured	Reference Range
Nitrate	NO_3^-	**0,5**	1 - 10
Nitrite	NO_2^-	**n.d.**	n.d. - 0,15
Phosphorus (ICP-OES)	P	**0,014**	0,006 - 0,060
Total Phosphate (calculated)	$PO_4^{3-}{}_{tot.}$	**0,043**	0,02 - 0,18
ortho-Phosphate (photometric)	PO_4^{3-}	**0,012**	0,02 - 0,10
Silicon	Si	**0,16**	0,1 - 0,2
Silicate (calculated)	SiO_2	**0,34**	0,2 - 0,4

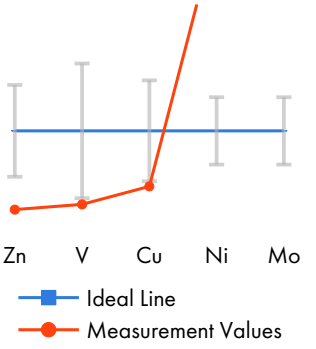


ORGANIC FACTORS

		measured	Reference Range	
Total Phosphate : Nitrate	$PO_4^{3-}{}_{tot.}/NO_3^-$	**0,09**	90 - 110	
Total Phosphate : ortho-Phosphate	$PO_4^{3-}{}_{tot.}/PO_4^{3-}$	**3,583**	**1,00**	
Total Phosphate : Iodine	$PO_4^{3-}{}_{tot.}/I$	**0,11**	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	**1,21**	3	- 5,5 -	8
Vanadium	V	**1,63**	2	- 6 -	10
Copper	Cu	**1,8**	2	- 4 -	6
Nickel	Ni	**13,5**	3	- 4,5 -	6
Molybdenum	Mo	**93,5**	10	- 15 -	20

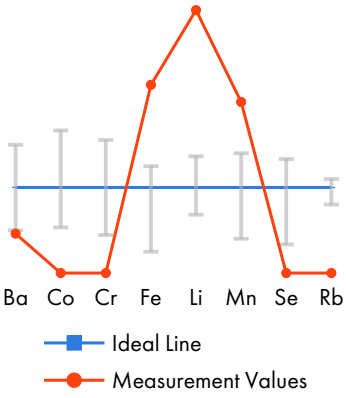


PHYSIOLOGICALLY RELEVANT TRACE ELEMENTS in µg/Liter

			measured	Reference Range		
Barium	Ba		**4,6**	5	- max.	50
Cobalt	Co		**n.d.**	n.d.	- max.	1,9
Chromium	Cr		**n.d.**	n.d.	- max.	2,3
Iron	Fe		**4,4**	n.d.	- max.	2,5
Lithium	Li	*	**676**	180	- max.	350
Manganese	Mn		**0,2**	n.d.	- max.	0,25
Selenium	Se		**n.d.**	n.d.	- max.	2,0

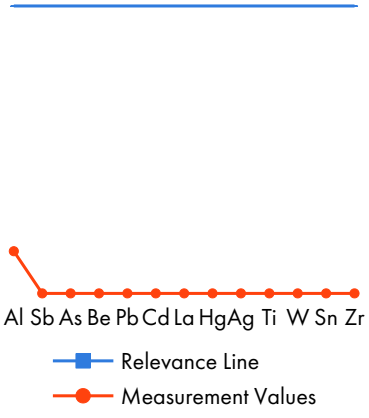
only with ICP-MS upgrade:

Rubidium	Rb	**not measured**



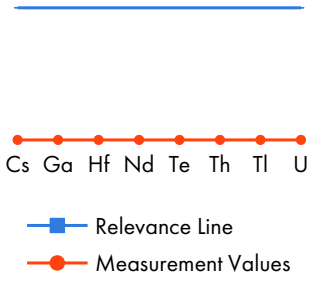
OTHER TRACE ELEMENTS AND POTENTIAL POLLUTANTS in µg/Liter

		measured	Reference Range		
Aluminum	Al	**4,4**	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	**n.d.**	**n.d.**
Calcium	Ca	**n.d.**	**n.d.**
Potassium	K	**n.d.**	**n.d.**
Magnesium	Mg	**n.d.**	**n.d.**
Sodium	Na	**n.d.**	**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	**0,04**	**n.d.**
Silicate (calculated)	SiO_2	**0,08**	**n.d.**
in µg/Liter			
Barium	Ba	**n.d.**	**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	1116,8 ml	3 days	372,3 ml/day	1	☐☐☐
ELEMENTALS K	No dosage				
ELEMENTALS B	No dosage				
ELEMENTALS MG	No dosage				
ELEMENTALS SR	No dosage				
ELEMENTALS BR	No dosage				
ELEMENTALS F	457,1 ml	2 days	228,6 ml/day	2	☐☐
TRACE I	Water change			2	
ELEMENTALS P	37,1 ml	2 days	18,6 ml/day	2	☐☐
TRACE ZN	5,7 ml	2 days	2,9 ml/day	3	☐☐
TRACE V	11,6 ml	3 days	3,9 ml/day	3	☐☐☐
TRACE CU	29,2 ml	2 days	14,6 ml/day	3	☐☐
TRACE NI	Water change			3	
TRACE MO	Water change			3	
TRACE BA	143,4 ml	2 days	71,7 ml/day	4	☐☐
TRACE CO	3,3 ml	1 day	3,3 ml/day	4	☐
TRACE CR	31,3 ml	3 days	10,4 ml/day	4	☐☐☐
TRACE FE	No dosage				
TRACE LI	No dosage				
TRACE MN	No dosage				
TRACE SE	84,8 ml	4 days	21,2 ml/day	4	☐☐☐☐
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.