

KANSO TECHNOS CO., LTD.

**Certificate of Analysis****Certified Reference Material
KANSO CRM Lot.CQ****Reference Material for Nutrients in Seawater (RMNS)**

This certified reference material (CRM) was produced using treated natural seawater on the basis of quality control system under ISO 17034 (JIS Q 17034), for use in managing analysis precision or verifying performance of analytical methods or instruments for analysis of nutrients in seawater or matrices similar to seawater.

1. Name and Location of the Manufacturer/Analysis Facility

KANSO TECHNOS CO., LTD.

Laboratory for Instrumentation and Analysis

3-1-1, Higashikuraji, Katano, Osaka, 576-0061, Japan

2. Name of Reference Material and Sample Form

Name: Reference Material for Nutrients in Seawater (RMNS)

Sample: About 90 mL of this CRM solution in a 100 mL polypropylene bottle (vacuum-sealed in aluminum-film bag).

3. Certified Values

The certified values of 4 types of nutrients are shown in the table below. The expanded uncertainty in the table represents combined standard uncertainty calculated using a coverage factor (k) of 2 which gives approximately 95 % level of confidence. The standard deviation (SD) of between-bottle is calculated based on the results of 180 bottles (except for recertified silicate: 200 bottles), measured in duplicates, following ISO Guide 35 (JIS Q 0035) guideline.

	Certified Value ($\mu\text{mol/kg}$)	Expanded Uncertainty ($\mu\text{mol/kg}$)	Between-Bottle SD ($\mu\text{mol/kg}$)	Analysis Method
Nitrate	0.06	0.03	0.005	Japan Meteorological Agency, Manual for Oceanographic Observation (1999); Cu-Cd reduction Naphthylethylenediamine photometric method (section 5.5.7.3)
Nitrite	0.07*	0.07	0.0006	Japan Meteorological Agency, Manual for Oceanographic Observation (1999); Naphthylethylenediamine photometric method (section 5.5.7.4)
Silicate	2.20	0.07	0.011	Japan Meteorological Agency, Manual for Oceanographic Observation (1999); Molybdenum blue method (section 5.5.7.2)
Phosphate	0.030	0.009	0.0010	Japan Meteorological Agency, Manual for Oceanographic Observation (1999); Molybdenum blue method (section 5.5.7.1)

* Concerning RMNS nitrite, a trend of increasing concentration ($0.004 \pm 0.002 \mu\text{mol/kg}$ per year) has been confirmed.

4. Value Determination

The certified values were arithmetic means of the results of 30 bottles each (except for recertified silicate: an arithmetic means of the results of 10 bottles each), measured in duplicates, analyzed by KANSO TECHNOS CO., LTD. (KANSO) and Japan Agency for Marine-Earth Science and Technology (JAMSTEC) with colorimetric method (continuous flow analysis, CFA, method) based on Manual for Oceanographic Observation (1999), Japan Meteorological Agency. The salinity of calibration solutions was adjusted to the salinity of this CRM ± 0.5 psu.

5. Traceability

Each certified value of nitrate, nitrite, and phosphate was determined by one of Japan Calibration Service System (JCSS) standard solutions for each nitrate ions, nitrite ions, and phosphate ions. Silicate value was determined by a silicon standard solution (AA) traceable to the National Metrology Institute of Japan (NMIJ) primary standard solution (NMIJ CRM 3645-a). Along with the measurement of this CRM, NMIJ's seawater for nutrients CRMs and KANSO CRMs were analyzed. The results of the measured CRMs uncertainty ranges and expanded uncertainty ($k = 2$) of the certified values overlapped one another. The tables below describe the standard lots and CRMs used during the analysis.

Standard solutions lot number.

	Supplier	Name / Description	Lot Number
Nitrate	FUJIFILM Wako Pure Chemical Corporation	Nitrate Ion Standard Solution (NO ₃ ⁻ 1000)	DLM2664
Nitrite	FUJIFILM Wako Pure Chemical Corporation	Nitrite Ion Standard Solution (NO ₂ ⁻ 1000)	DLJ3947
Silicate	KANSO TECHNOS CO., LTD.	Silicon Standard Solution (Si 1000 mg/kg)	AA
Phosphate	FUJIFILM Wako Pure Chemical Corporation	Phosphate Ion Standard Solution (PO ₄ ³⁻ 1000)	TPP1439

CRMs measured during this certification analysis.

	NMIJ CRM Number / Lot Number
NMIJ CRMs	7601-a, 7602-a, 7603-a
KANSO CRMs	CK, CL, CR, CO, CP, CM, CN
For silicate recertification	7601-a, 7602-a, 7603-a CR, CO, CP, CM, CN

6. Raw Material and Processing Method

Collected location: (1) Ogasawara Islands, Japan; surface seawater.

Raw seawater was filtered (0.45 μ m membrane filter), autoclave treatments (2 sets of 120 °C for 2 h) conducted, and about 90 mL aliquots of treated seawater were transferred into 100 mL polypropylene bottles in a clean room. (No additives)

7. Intended Use

Seawater nutrient reference material solution for nutrients analysis. (Do not use for other purposes)

8. Storage and Usage Specifications

Do not freeze (the composition of the product may change).

Store at room temperature below 40 °C.

Because of no additives or preservatives, the quality is not ensured for reuse after opening the outer seal.

Do not dilute or concentrate the product.

Shake well and open the seal right before use.

When sampling the product, do not insert objects to prevent contamination.

9. Certified Date

2022/12/27

1 0. Production Date

2021/5/20

1 1. Expiration and Guarantee Date

Under unopened and stored condition described in section 8, this CRM's expiration and guarantee date is 2028/5/19.

1 2. Homogeneity

Out of 2500 bottles produced, 6 sets, each set consisting of randomly selected 30 bottles were analyzed (total of 180 bottles analyzed). As for silicate, including 2 sets of 10 bottles each for recertification (20 bottles), the total of 200 bottles were analyzed. The level of homogeneity was assessed from the results and confirmed acceptable homogeneity. Standard uncertainty associated with sample homogeneity is reflected in the uncertainties of the certified values. The standard deviations of between-bottle for 180 or 200 bottles analyzed are given in the table in section 3.

1 3. Additional Information

(1) Salinity **34.703 psu** (standard deviation 0.0001 psu; $n = 10$)

An electrical conductivity measurement method in Japan Meteorological Agency, Manual for Oceanographic Observation (1999), was used to measure salinity.

(2) RMNS nitrite

An increasing trend ($0.004 \pm 0.002 \mu\text{mol/kg}$ per year) has been confirmed.

(3) RMNS ammonium

The ammonium in RMNS under refrigerated storage has been found to be stable up to 4 years.

	Reference Value ($\mu\text{mol/kg}$)	Expanded Uncertainty ($\mu\text{mol/kg}$)	Between-Bottle SD ($\mu\text{mol/kg}$)	Analysis Method
Ammonium	1.76	0.07	0.009	Japan Meteorological Agency, Manual for Oceanographic Observation (1990); Indophenol blue colorimetric method

1 4. Health and Safety

Do not eat or drink the product.

Because the product is seawater, generally, it can be disposed by diluting; however, follow local jurisdictions when carrying out the disposal procedure.

Lot.CQ

Issue no. : 20**-00***
Issue date : m** d**, y20**

1 5 . Limitations of Copied Certificate

When copying this certificate, make clear indication as such in the copied certificate.

1 6 . Technical Information

The buyer of this CRM shall be notified when changes in property values and/or any important changes are made in relation to this product. For more technical information, contact us at the address or webpage below.

1 7 . Name and Signature of Party Responsible for Production and Certification

KANSO TECHNOS CO., LTD.

Laboratory for Instrumentation and Analysis

Director: Takashi KITAO

Sample

Revision history

2023/07/06 ; The property value for silicate was revised and changed to a certified value.

For any inquiry, please contact us



KANSO TECHNOS CO., LTD.

Laboratory for Instrumentation and Analysis

3-1-1, Higashikuraji, Katano, Osaka, 576-0061, Japan

TEL : +81-72-810-6551 FAX : +81-72-810-6552

E-mail: RMinfo@kanso.co.jp

Webpage : <http://www.kanso.co.jp/eng/production/index.html>