ICS 07. 060

N 92

HY

Ocean Industry Standard of the People's Republic of China

HY/T 099-2007

Test method of seawater nutrients analyzer

海水营养盐测量仪检测方法

(English Translation)

Issue date: 2007-12-19 Implementation date: 2008-01-01

Issued by State Oceanic Administration of the People's Republic of China

Foreword

SAC/TC 283 is in charge of this English translation. In case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

Annex A of this standard is normative, while Annex B and Annex C are informative.

This standard was proposed by National Center of Ocean Standards and Metrology.

This standard was prepared by National Technical Committee 283 on Ocean of Standardization Administration of China (SAC/TC283).

Test method of seawater nutrients analyzer

1 Scope

This standard specifies the test items, test equipments, test environmental conditions, test methods of the seawater nutrients analyzer (hereinafter referred to as the analyzer) and writing requirements for test reports.

This standard is applicable to the test of seawater nutrients analyzer for long-term in-field use.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this standard. For dated references, subsequent amendments, or revisions, of any of these publications do not apply to this standard. However parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

HY 016.3 *The basic method of environmental test of oceanographic instruments low temperature storage test*

HY 016.4 *The basic method of environmental test of oceanographic instruments high temperature test*

HY 016.5 *The basic method of environmental test of oceanographic instruments high temperature storage test*

HY 016.8 *The basic method of environmental test of oceanographic instruments alternate humidity test*

HY 016.11 *The basic method of environmental test of oceanographic instruments vibration test*

HY 016.12 *The basic method of environmental test of oceanographic instruments shock test*

HY 016.13 *The basic method of environmental test of oceanographic instruments bump test*

HY 016.14 *The basic method of environmental test of oceanographic instruments inclination and rolling-pitching test*

HY 016.15 *The basic method of environmental test of oceanographic instruments hydrostatic pressure test*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 in-field seawater nutrients analyzer

Analyzer applicable to marine in-field investigation, and could inject sample, produce chemical reaction, analyze nutrients in seawater automatically

Note: modify HY/T 093 - 2005, terms 3.2.

4 Technical requirements

4.1 Appearance

The appearance requirements for the analyzer are as follows:

a) The shell of the analyzer, the paint coat and clad layer of the surface shall be uniform in color, smooth and firm, there shall be no obvious abrasion, rust corrosion, leakage, crack or bubble;

b) The electrode lead connection of the analyzer shall be reliable, and the fasteners and connectors shall not be loose.

4.2 Metrological performance

The analyzer metrological performance requirements are given in table 1.

Table 1 the analyzer metrological performance

parameter	detection range / (μmol/L)	indication error / (μmol/L)
NO_3-N	0.5～20	the reading value≤ 5.0, ±0.5 μmol/L; the reading value≥5.0, ±10% ×reading value
NO_2-N	0.5～7	the reading value≤ 3.0, ±0.3 μmol/L the reading value≥ 3.0, ±10% ×reading value
PO_4-P	0.2～3	the reading value≤ 1.3, ±0.13 μmol/L; the reading value≥ 1.3, ±10% ×reading value
SiO_3-Si	0.5～20	the reading value≤ 5.0, ±0.5 μmol/L; the reading value≥ 5.0, ±10% ×reading value
NH_4-N	0.5～20	the reading value≤ 5.0, ±0.75 μmol/L; the reading value≥ 5.0, ±15% ×reading value

5 Test items

The test items of the analyzer are as follows:

a) Appearance inspection;

b) Metrological performance tests include indication error, repeatability, temperature influence and detection limit;

c) Environmental adaptability test.

6 Test equipments

The test equipments for metrological performance of analyzer are given in Table 2.

Table 2 Test Equipments for Metrological Performance of analyzer

S/N	Equipments	Technical index
1	nutrients standard substance	Certified Reference Material(CRM), or prepare nutrients standard working solution as required in annex A
2	analytical balance	minimum division value is 0.0001 g
3	high-low temperature test chamber	
Note: Unless otherwise specified, the reagents used in this method are analytically pure (AR), and the water is deionized water or equivalent conductivity of pure water.		

7 Test environmental conditions

The test environmental conditions requirements for the analyzer are as follows:

a) Ambient temperature: (20±5) ℃;

b) Relative humidity :≤ 80%;

c) Supply voltage: AC (220±20) V, (50±2.5) Hz;

d) There shall be no electromagnetic interference that affects the normal operation of the analyzer.

8 Test methods

8.1 Appearance inspection

Visual inspection and tactile examination shall be used to inspect the appearance of the analyzer according to 4.1.

8.2 Metrological performance test

8.2.1 NO_3-N test

8.2.1.1 Indication error test

The NO_3-N standard solution of primary CRM shall be used as measurement standard, and select 3 different concentrations of the standard solution to cover the measurement range. Or the NO_3-N standard working solution prepared as required in Annex A.3 shall be used as the measurement standard.

At the ambient temperature of (20±5) ℃, NO_3-N standard solutions shall be measured according to the operation rules of the analyzer, in the process of venting, cleaning, self-inspection, sampling, and from low concentration to high concentration. The measurement of each standard solution shall be repeated for 3 times and the average value shall be calculated as measurement value of analyzer.

When NO_2-N≤3.0 μmol/L, NO_3-N≤5.0 μmol/L, NH_4-N≤5.0 μmol/L, PO_4-P≤1.3 μmol/L and SiO_3-Si ≤5.0 μmol/L respectively, calculate indication error of the analyzer according to formula (1):

$$\Delta C_j = C_{jp} - C_{js} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

Where

$\triangle C_j$ is the indication error on the j^{th} concentration test point, (μmol/L);

C_{jp} is the average concentration measurement value on the j^{th} concentration test point, (μmol/L);

C_{js} is the standard concentration value on the j^{th} concentration test point, (μmol/L);

When NO_2-N≥3.0 μmol/L, NO_3-N≥5.0 μmol/L, NH_4-N≥5.0 μmol/L, PO_4-P≥1.3 μmol/L and SiO_3-Si ≥5.0 μmol/L respectively, calculate indication error of the analyzer according to formula (2):

$$\delta = \left[(C_{jp} - C_{js})/C_{js}\right] \times 100\% \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (2)$$

Where

C_{jp} and C_{js} have the same meaning with formula (1);

δ is the relative error of measurement; %.

8.2.1.2 Repeatability test

At the ambient temperature of (20±5) ℃, any concentration of NO_3-N standard solution shall be repeatedly measured no less than 6 times according to the operation rules of the analyzer.

Calculate the repeatability of the analyzer according to formula (3):

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(C_i - C_p)^2}{n-1}} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (3)$$

Where

σ is the experimental standard deviation of nutrients concentration measurement;

C_i is the measurement concentration value on the i^{th} concentration test point, (μmol/L);

C_p is the average value of the analyzer on the i^{th} concentration test point, (μmol/L);

n is measurement times.

8.2.1.3 Temperature influence error

The analyzer and NO_3-N standard solution of any concentration shall be placed in a high-low temperature test chamber, the chamber temperature shall be adjusted to 5℃ and 35℃ respectively, and analyzer and NO_3-N standard solution shall be fully balanced to chamber temperature. According to the operation rules of the analyzer, the measurement of each standard solution shall be repeated separately for 3 times, and the average value shall be calculated as measurement value of analyzer.

Separately calculate the error caused by temperature influence according to formula (4):

$$\Delta C_i = C_{ip} - C_{is} \quad \cdots\cdots (4)$$

Where

$\triangle C_i$ is the error of indication on the ith temperature test point, (μmol/L);

C_{ip} is the average value on the ith temperature test point, (μmol/L);

C_{is} is the standard value of standard solution on the ith temperature test point, (μmol/L);

8.2.1.4 Detection limit test

At the ambient temperature of (20±5) ℃, blank solution shall be measured standard repeatedly, according to the operation rules of the analyzer, and the measurement times shall be no less than 10. Calculate experimental standard deviation of analyzer measurement results according to formula (5):

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(C_i - C_p)^2}{n-1}} \quad \cdots\cdots (5)$$

Where

σ is the experimental standard deviation of blank solution, (μmol/L);

C_i is the measurement value of blank solution on the ith concentration test point, (μmol/L);

C_p is the average value of measurement results for blank solution, (μmol/L);

n is measurement times.

Calculate detection limit of the analyzer according to formula (6):

$$D.L = 2\sqrt{2} \cdot t \cdot \sigma \quad \cdots\cdots (6)$$

Where

$D.L$ is the detection limit of analyzer, (μmol/L);

t is the bilateral t-distribution table (Refer to t-distribution table. When n=10, a (fiducial probability) =0.95, t=2.2281).

8.2.2 NO_2-N test

8.2.2.1 Indication error test

The NO_2-N standard solution of primary CRM shall be used as measurement standard, and select 3 different concentrations of the standard solution to cover the measurement range. Or the NO_2-N standard working solution prepared as required in Annex A.4 shall be used as the measurement standard.

The test shall be conducted according to the method specified in 8.2.1.1.

8.2.2.2 Repeatability test

One of the above three NO_2-N standard solutions shall be measured according to the method specified in 8.2.1.2.

8.2.2.3 Temperature influence error

One of the above three NO_2-N standard solutions shall be measured according to the method specified in 8.2.1.3.

8.2.2.4 Detection limit test

Blank solution shall be measured standard according to the method specified in 8.2.1.4.

8.2.3 PO_4-P test

8.2.3.1 Indication error test

The PO_4-P standard solution of primary CRM shall be used as measurement standard, and select 3 different concentrations of the standard solution to cover the measurement range. Or the PO_4-P standard working solution prepared as required in Annex A.5 shall be used as the measurement standard.

The test shall be conducted according to the method specified in 8.2.1.1.

8.2.3.2 Repeatability test

One of the above three PO_4-P standard solutions shall be measured according to the method specified in 8.2.1.2.

8.2.3.3 Temperature influence error

One of the above three PO_4-P standard solutions shall be measured according to the method specified in 8.2.1.3.

8.2.3.4 Detection limit test

Blank solution shall be measured standard according to the method specified in 8.2.1.4.

8.2.4 SiO_3-Si test

8.2.4.1 Indication error test

The SiO_3-Si standard solution of primary CRM shall be used as measurement standard, and select 3 different concentrations of the standard solution to cover the measurement range. Or the SiO_3-Si standard working solution prepared as required in Annex A.6 shall be used as the measurement standard.

The test shall be conducted according to the method specified in 8.2.1.1.

8.2.4.2 Repeatability test

One of the above three SiO_3-Si standard solutions shall be measured according to the method specified in 8.2.1.2.

8.2.4.3 Temperature influence error

One of the above three SiO_3-Si standard solutions shall be measured according to the method specified in 8.2.1.3.

8.2.4.4 Detection limit test

Blank solution shall be measured standard according to the method specified in 8.2.1.4.

8.2.5 NH_4-N test

8.2.5.1 Indication error test

The NH_4-N standard solution of primary CRM shall be used as measurement standard, and select 3 different concentrations of the standard solution to cover the measurement range.

Or the NH_4-N standard working solution prepared as required in Annex A.7 shall be used as the measurement standard.

The test shall be conducted according to the method specified in 8.2.1.1.

8.2.5.2 Repeatability test

One of the above three NH_4-N standard solutions shall be measured according to the method specified in 8.2.1.2.

8.2.5.3 Temperature influence error

One of the above three NH_4-N standard solutions shall be measured according to the method specified in 8.2.1.3.

8.2.5.4 Detection limit test

Blank solution shall be measured standard according to the method specified in 8.2.1.4.

8.3 Environmental adaptability test

8.3.1 Environmental test

The specific parameters of environmental test items shall be determined according to the environmental conditions of the analyzer. The environmental test methods are given in Table 3.

Table 3 environmental test method of analyzer

S/N	Environmental test item	Environmental test method
1	Low temperature storage test	According to HY 016.3
2	Low temperature test	According to HY 016.2
3	High temperature storage test	According to HY 016.5
4	High temperature test	According to HY 016.4
5	Shock test	According to HY 016.12
6	Inclination and rolling-pitching test	According to HY 016.14
7	Bump test	According to HY 016.13
8	Vibration test	According to HY 016.11
9	Alternate humidity test	According to HY 016.8
10	Hydrostatic pressure test	According to 016.15

8.3.2 Verification test of metrological performances

After the environmental test, the metrological performances shall be tested again according to 8.2.

9 Test Report

The test report shall be accurately and objectively, and each test result shall include the following information:

a) The title -"Test Report";

b) Name and address of test organizations, place where test carried out;

c) Unique identification of the test report and its each page, for ensuring that the page is the part of the test report; and clear identification indicating the end of the test report;

d) Customer's name and address;

e) Tested analyzer name, model/type, serial number, and manufacturer;

f) Technical documentations to be based on;

g) Name, position, signature or equivalent identification of authorizer of the test report;

h) Signature or equivalent identification of analyst and verifier;

i) Description and state of the tested instrument;

j) List of main measuring instruments used in the test, including model/type, uncertainty /accuracy /maximum permissible error, certificate Number.

k) Test time, location and environmental conditions;

l) Test results.

The test record format see Annex B.

The test report format see Annex C.

Annex A

(Normative Annex)

Preparation of Nutrients Standard Solution

A.1 Reagent materials

Unless otherwise specified, the chemical reagents used in this standard shall be analytical reagent (Grade AR), and the water shall be deionized or equivalent conductivity of pure water.

A.2 Preparations of artificial seawater

Weigh 31 g NaCl (Grade GR), 10 g $MgSO_4 \cdot 7H_2O$ (Grade GR), 0.05 g $NaHCO_3 \cdot H_2O$ (Grade GR) and dissolve in water. Diluted to 1 L with the deionized water. The salinity is 35.

A.3 Preparation of NO_3-N standard solutions

A.3.1 NO_3-N standard stock solutions

Weigh 1.011 g KNO_3 (pre-dried at 110° C for 1 h, then cooled to room temperature in the drying vessel) and dissolve in a little of deionized water. Dilute to 1000 mL volumetric flask, and add 1.0 mL $CHCl_3$. The concentration is 10.00 mmol/L NO_3-N, and its valid period is 6 months.

A.3.2 NO_3-N standard working solution

Take 10.00 mL standard stock solutions and dilute to 100 mL volumetric flask by deionized water and mix evenly. The solution is 1.0mmol/L NO_3-N, which is prepared before use.

A.3.3 NO_3-N standard solution

Take 1.00 mL, 5.00 mL, 20.0 mL, 50.0 mL and 90.0 mL NO_3-N standard working solution separately, dilute to five 1 000 mL volumetric flasks with artificial seawater and mix evenly. The concentration is respectively 1.0 μmol/L, 5.0 μmol/L, 20.0 μmol/L, 50.0 μmol/L and 90.0 μmol/L.

A.4 Preparation of NO_2-N standard solution

A.4.1 NO_2-N standard stock solution

Weigh 0.3450 g $NaNO_2$ (pre-dried at 110° C for 1 h, then cooled to room temperature in the drying vessel) and dissolve with a little of deionized water, then, dilute to 500 mL volumetric flask, and add 1.0 mL $CHCl_3$. The concentration is 10.00 mmol/L NO_2-N, and its valid period is 2 months.

A.4.2 NO_2-N standard working solution

Take 10.00 mL standard stock solutions and dilute to 100 mL volumetric flask by deionized water and mix evenly. The solution is 1.0mmol/L NO_3-N, which is prepared

before use, and its valid period is 4h.

A.4.3 NO_2-N standard solution

Take 1.00 mL, 5.00 mL, 20.0 mL, 50.0 mL and 90.0 mL NO_2-N standard working solution separately, dilute to five 1 000 mL volumetric flasks with artificial seawater and mix evenly. The concentration is respectively 1.0 μmol/L, 5.0 μmol/L, 20.0 μmol/L, 50.0 μmol/L and 90.0 μmol/L.

A.5 Preparation of PO_4-P standard solution

A.5.1 PO_4-P standard stock solution

Weigh 1.088 g KH_2PO_4 (pre-dried at 110° C for 1 h, then cooled to room temperature in the drying vessel) and dissolve with a little of deionized water, then, dilute to 1000 mL volumetric flask, and add 1.0 mL $CHCl_3$. The concentration is 8.00 mmol/L PO_4-P, and its valid period is 6 months.

A.5.2 PO_4-P standard working solution

Take 10.00 mL standard stock solutions and dilute to 100 mL volumetric flask by deionized water and mix evenly. The solution is 0.8mmol/L PO_4-P, which is prepared before use, and its valid period is 24h.

A.5.3 PO_4-P standard solution

Take 1.00 mL, 3.00 mL, 5.00 mL PO_4-P standard working solution separately, dilute to five 1 000 mL volumetric flasks with artificial seawater and mix evenly. The concentration is respectively 0.8 μmol/L, 2.4 μmol/L and 4.0 μmol/L.

A.6 Preparation of SiO_3-Si standard solution

A.6.1 SiO_3-Si standard stock solution

Weigh 4.702 g Na_2SiF_6 (pre-dried at 110° C for 1 h, then cooled to room temperature in the drying vessel) and dissolve with a little of deionized water, then, dilute to 1000 mL volumetric flask, and add 1.0 mL $CHCl_3$. The concentration is 25.0 mmol/L SiO_3-Si, and its valid period is 12 months.

A.6.2 SiO_3-Si standard intermediate solution

Take 8.00 mL standard stock solutions and dilute to 200 mL volumetric flask by deionized water, add 3 drops of $CHCl_3$ and mix evenly. The solution is 1.00mmol/L SiO_3-Si, and its valid period is 24h.

A.6.3 SiO_3-Si standard working solution

Take 10.00 mL standard intermediate solution and dilute to 100 mL volumetric flask by deionized water and mix evenly. The solution is 0.100mmol/L SiO_3-Si, which is prepared before use.

A.6.4 SiO_3-Si standard solution

Take 5.00 mL, 20.0 mL SiO_3-Si standard working solution and 20.0mL, 50.0mL, 80.0mL SiO_3-Si standard intermediate solution separately, dilute to five 1 000 mL volumetric flasks with artificial seawater and mix evenly. The concentration is respectively 0.50 μmol/L, 2.00 μmol/L, 20.0 μmol/L, 50.0 μmol/L and 80.0 μmol/L.

A.7 Preparation of NH_4-N standard solution

A.7.1 NH_4-N standard stock solution

Weigh 0.5349 g NH_4Cl (pre-dried at 110° C for 1 h, then cooled to room temperature in the drying vessel) and dissolve with a little of deionized water, then, dilute to 1000 mL volumetric flask, and add 1.0 mL $CHCl_3$. The concentration is 10.0 mmol/L NH_4-N, and its valid period is 6 months.

A.7.2 NH_4-N standard intermediate solution

Take 20.00 mL standard stock solutions and dilute to 200 mL volumetric flask by deionized water, and mix evenly. The solution is 1.00mmol/L NH_4-N, and its valid period is at current day.

A.7.3 NH_4-N standard working solution

Take 10.00 mL standard stock solutions and dilute to 100 mL volumetric flask by deionized water, and mix evenly. The solution is 0.100 mmol/L NH_4-N, which is prepared before use.

A.7.4 NH_4-N standard solution

Take 5.00 mL, 20.0 mL NH_4-N standard working solution and 20.0mL, 50.0mL, 80.0mL NH_4-N standard intermediate solution separately, dilute to five 1 000 mL volumetric flasks with artificial seawater and mix evenly. The concentration is respectively 0.50 μmol/L, 2.00 μmol/L, 20.0 μmol/L, 50.0 μmol/L and 80.0 μmol/L.

Annex B

(Informative Annex)

Formats of test record

The formats of test record are given in Table B.1 and Table B.2.

Table B.1 Formats of Analyzer Metrological Performance Test

Customer								
Model/Type				Serial No.				
Main measuring instruments used in the test								
Test location				Test date				
Environmental conditions	Temperature: ℃ Humidity: %RH							
Appearance								
Standard concentration μmol/L	Instrument indication μmol/L							Indication error μmol/L
	1	2	3	Average				
Standard concentration μmol/L	Instrument indication μmol/L							Experimental standard deviation μmol/L
	1	2	3	4	5	6	Average	
Solution temperature ℃	Standard concentration μmol/L	Instrument indication μmol/L						Indication error μmol/L
		1	2	3	Average			

Standard concentration μmol/L	Instrument indication μmol/L						Experimental standard deviation μmol/L	Detection limit μmol/L
	1	2	3	4	5	6		
	7	8	9	10	11	12		

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Table B.2 Formats of instrument environmental test

Instrument name		Test item	
Test date		Reference of the test	
Room temperature		Relative humidity	
Test conditions			
Test record			

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Annex C

(Informative Annex)

Formats of test report

The front-page format of test report is given in Figure C.1, and the inside page format is given in Figure C.2 and C.3.

XXX (Organization name)

Test Report

Report No. _____

Customer _____

Customer Address _____

Instrument name _____

Model/Specification _____

Serial Number _____

Manufacturer _____

Issue date _____

Approved by ____(Signature)_____

(Stamp for Test)

Name ___(typed in Roman)_____

Position _____

Address: Postal code: Fax: Tel.:

Figure C.1 Homepage format of test report

<table>
<tr><td colspan="14">Main measuring instruments used in the test</td></tr>
<tr><td colspan="4">Name</td><td colspan="4">Model/Type</td><td colspan="4">Uncertainty / Accuracy / Maximum Permissible Error</td><td colspan="2">Certificate No.</td></tr>
<tr><td colspan="4"></td><td colspan="4"></td><td colspan="4"></td><td colspan="2"></td></tr>
<tr><td colspan="4"></td><td colspan="4"></td><td colspan="4"></td><td colspan="2"></td></tr>
<tr><td colspan="14">Test time, Location, and Environmental conditions</td></tr>
<tr><td colspan="7">Location:
Temperature:</td><td colspan="7">Date:
Relative humidity:</td></tr>
<tr><td colspan="14">Test results for metrological performance</td></tr>
<tr><td colspan="2" rowspan="2">Standard value μmol/L</td><td colspan="10">Instrument indication μmol/L</td><td colspan="2" rowspan="2">Indication error μmol/L</td></tr>
<tr><td colspan="3">1</td><td colspan="3">2</td><td colspan="3">3</td><td>average</td></tr>
<tr><td colspan="2"></td><td colspan="3"></td><td colspan="3"></td><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2"></td><td colspan="3"></td><td colspan="3"></td><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2"></td><td colspan="3"></td><td colspan="3"></td><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2" rowspan="2">Standard value μmol/L</td><td colspan="10">Instrument indication μmol/L</td><td colspan="2" rowspan="2">Experimental standard deviation μmol/L</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>average</td></tr>
<tr><td colspan="2"></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td rowspan="2">Solution temper-ature ℃</td><td rowspan="2">Standard μmol/L</td><td colspan="8">Instrument indication μmol/L</td><td colspan="2" rowspan="2">Indication error μmol/L</td></tr>
<tr><td colspan="3">1</td><td colspan="3">2</td><td colspan="2">3</td><td>average</td></tr>
<tr><td></td><td></td><td colspan="3"></td><td colspan="3"></td><td colspan="2"></td><td></td><td colspan="2"></td></tr>
<tr><td></td><td></td><td colspan="3"></td><td colspan="3"></td><td colspan="2"></td><td></td><td colspan="2"></td></tr>
<tr><td></td><td></td><td colspan="3"></td><td colspan="3"></td><td colspan="2"></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2" rowspan="2">Blank solution μmol/L</td><td colspan="8" rowspan="2">Instrument indication μmol/L</td><td colspan="2" rowspan="2">Experimental standard deviation μmol/L</td><td colspan="2" rowspan="2">Detection limit μmol/L</td></tr>
<tr></tr>
<tr><td colspan="2" rowspan="4"></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td colspan="2" rowspan="4"></td><td colspan="2" rowspan="4"></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="14"></td></tr>
</table>

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Figure C.2 Inside page format of test results for metrological performance of test report

Main measuring instruments used in the test			
Name	Model/Type	Uncertainty / Accuracy /Maximum Permissible Error	Certificate No.
Test time, location, and environmental conditions			
Location:		Date:	
Temperature:		Relative Humidity:	
Environmental adaptability test results			

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Figure E.3 Inside page format of test results for environmental adaptability of test report

References:

[1] GB 17378.4 *The Specification for Marine Monitoring Part 4: Seawater Analysis*.

[2] GB/T 12763.4-1991 *The specification for oceanographic survey observations of chemical parameters in seawater*.

[3] HY/T 008-1992 *Marine analyzers terminology*.

[4]HY/T 093-2005 *Seawater nutrients automatic analyzer*.