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National Metrological Verification Regulation of the People's Republic of China

JJG 1094-2013

Water Quality On-line Analyzers of Total Phosphorus and Total Nitrogen

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Water Quality On-line Analyzers
of Total Phosphorus and Total Nitrogen

Jurisdiction organization: National Technical Committee on Environment
Stoichiometry

Main drafting organization: Zhejiang Province Institute of Metrology

Participating drafting organizations: Focused Photonics (Hangzhou) Co, Ltd.
Zhejiang Province Environmental Monitoring Center

**This Regulation is entrusted to National Technical Committee on Environment
Stoichiometry for interpretation.**

Main drafters of this Regulation:

Lin Zhen (Zhejiang Province Institute of Metrology)
Zhang Xiao (Zhejiang Province Institute of Metrology)

Participating drafters:

Wang Jing (Focused Photonics (Hangzhou) Co, Ltd.)
Xu Yuanyuan (Zhejiang Province Institute of Metrology)
Fu Jun (Zhejiang Province Environmental Monitoring Center)

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Introduction

This Regulation is developed in accordance with the provisions in JJF 1002-2010 “The Rules for Drafting National Metrological Verification Regulation”, JJF 1001-2011 “General Terms in Metrology and Their Definitions” and JJF 1059.1-2012 “Evaluation and Expression of Uncertainty in Measurement”.

Technical indicators of this Regulation refer to relevant contents of HJ/T 102-2003 “The technical requirement for water quality automatic analyzer of total nitrogen” and HJ/T 103-2003 “The technical requirement for water quality automatic analyzer of total phosphorous”.

This Regulation is developed for the first time.

Verification Regulation of Water Quality On-line Analyzers of Total Phosphorus and Total Nitrogen

1 Scope

This Regulation applies to initial verification, follow-up verification and in-use inspection of water quality on-line analyzers of total phosphorus and total nitrogen.

2 Overview

The instruments are divided into instruments for separate measurement of total phosphorus or total nitrogen AND integrated measuring instruments of total phosphorus and total nitrogen. They are used to automatically and continuously measure total phosphorus concentration and total nitrogen concentration in surface water, domestic sewage, industrial waste water and other water bodies.

Total phosphorus measurement adopts ammonium molybdate spectrophotometric method; it uses oxidizing agent to turn phosphorus and oxygen contained in water INTO orthophosphate, which generates blue complex after reaction with color developing agent. The total phosphorus content can be obtained through measuring the absorbance value at a specific wave length.

Total nitrogen measurement mainly adopts alkaline potassium digestion UV spectrometry and hydrazine sulfate reduction visible spectrophotometry. The former uses oxidizing agent to turn nitrogen compounds in water INTO nitrate; the total nitrogen content can be obtained through measuring absorbance value at a specific wavelength. The latter firstly oxidizes nitrogen-containing compound, then reverts to nitrite for color reaction. The total nitrogen content can be obtained through measuring absorbance value at a specific wavelength. In addition, total nitrogen measurement may also adopt chemiluminescence method or other methods.

The instrument is mainly composed of sampling system, aqueous sample treatment system, detection system and data acquisition, processing and transmission system, etc.

3 Metrological performance requirements

Metrological performance requirements of the instrument are shown in Table 1.

Where,

s_r - Instrument repeatability;

c_i - Measured value of instrument for each time, mg/L;

\bar{c} - Average value of 6 measurements, mg/L;

n - Number of measurements, $n = 6$.

5.3.5 Stability

After instrument calibration, use 50% measuring range standard solution to measure; record initial measured value; then measure once per hour; measure for 24 h continuously; record the instrument measured values; calculate stability of the instrument based on Formula (4).

$$\Delta S = \frac{|c_i - c_0|_{\max}}{c_0} \times 100\% \quad (4)$$

Where,

ΔS - Instrument stability;

c_i - Measured value per hour, mg/L;

c_0 - Initial measured value, mg/L.

5.3.6 Safety performance

5.3.6.1 Insulation resistance

Power plug is not connected to power grid; power switch is at on-position; use insulation resistance meter to apply 500 V DC test voltage between power incoming line and enclosure; measure insulation resistance after being stabilized for 5 s.

5.3.6.2 Dielectric strength

Power plug is not connected to power grid; power switch of instrument is at on-position; apply test voltage between power incoming line and enclosure through withstanding voltage tester; test voltage gradually rises to 1.5 kV; maintains for 1 min to observe whether there is flashover and breakdown phenomena; then gradually drop to zero.

5.3.6.3 Leakage current

Power plug is connected to power grid; power switch is at on-position; leakage current tester is connected to between instrument enclosure and power incoming line. Adjust the voltage of leakage current tester to 242 V and measure once; change power polarity and

Annex A

Preparation of standard solution

A.1 Zero calibration solution of total phosphorus

Use distilled water or pure water that meets analysis laboratory Grade 2 water requirements.

A.2 Zero calibration solution of total nitrogen

Zero calibration solution of total nitrogen shall be non-ammonia water, which is prepared through one of following methods:

- a) Ion exchange method: Make distilled water to pass through strong acid cation exchange resin (hydrogen form) column; the effluent is collected in a glass bottle sealed with glass lid.
- b) Distillation method: Add 0.1mL of sulfuric acid (A. R. $\rho = 1.84 \text{ g/mL}$) into 1 000 mL of distilled water. Redistill it at all-glass distiller; discard the initial 50 mL of distillate; the remaining distillate is collected in a glass bottle sealed with glass lid.

A.3 Preparation of total phosphorus standard solution

Prepare standard solution of total phosphorus for verification based on concentration of standard solution of total phosphorus for verification in accordance with concentration of standard solution of total phosphorus for verification, amount and concentration of standard solution of total phosphorus in water. For example, accurately pipette 20 mL of total phosphorus constituent analysis standard solution of which the mass concentration is 500 mg/L; place in a 1 000 mL volumetric flask; use A.1 total phosphorus zero calibration solution to dilute to the mark; set the volume and shake well. That is the 1 L of total phosphorus standard solution of which the mass concentration is 10.0 mg/L. Standard solution of total phosphorus shall be prepared when it is needed.

A.4 Preparation of total nitrogen standard solution

Prepare the standard solution of total nitrogen for verification based on concentration of standard solution of total nitrogen for verification in accordance with concentration of standard solution of total nitrogen for verification, amount and the concentration of standard solution of total nitrogen in water. For example, accurately pipette 20 mL of total nitrogen constituent analysis standard solution of which the mass concentration is 500 mg/L; place in a 1 000 mL volumetric flask; use A.1 total nitrogen zero calibration solution to dilute to the mark; set the volume and shake well; That is the 1 L of standard solution of total nitrogen of which the mass concentration is 10. 0 mg/L. Standard solution of total nitrogen shall be prepared when it is needed.

C.3 Page 3 of verification results notice

Certificate No. XXXXX-XXXXX				
Verification Results				
Measuring range of instrument: _____				
Verification Item	Technical Requirements	Verification Results		Result Judgment
		Total Phosphorus	Total Nitrogen	
Appearance and power-on inspection				
Indication error				
Repeatability				
Stability				
Insulation resistance				
Dielectric strength				
Leakage current				
Verification results / non-conformance items:				
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