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**Calibration Specification for Flow Analyzers with
Spectrophotography
(English Translation)**

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1 Scope

This specification is applicable to the use of the principle of colorimetry to detect cyanide, volatile phenol in water, hexavalent chromium, sulfide, Calibration of flow analyzers for measuring the content of total phosphorus, total nitrogen, ammonia nitrogen, anionic surfactants and other components.

2 Overview

The flow analyzer is based on the color reaction between the substance to be measured and the reaction reagent in a flowing state, and the degree of color development is related to the degree of color development to be detected.

It is related to the concentration of the substance to be measured, and follows the Lambert-Beer law, so as to realize the quantitative analysis of the substance to be measured.

The flow analyzer is mainly composed of an autosampler, a peristaltic pump, a reaction module, a colorimeter, and a data acquisition and processing system.

It is widely used in water quality testing.

Flow analyzers can be divided into continuous flow analyzers and flow analyzers according

to whether the chemical reactions in the flow state reach equilibrium.

There are two types of automatic injection analyzers, and their workflows are shown in Figure 1 and Figure 2, respectively.

3 Metrological characteristics

The metrological characteristics are shown in Table 1.

4.1 Laboratory conditions

4.1.1

No obvious mechanical vibration, no electromagnetic interference, no direct sunlight.

4.1.2

The power supply voltage is (220 ± 22) V, the frequency is (50 ± 0.5) Hz, and the instrument is well grounded.

4.1.3

Indoor temperature $(10\sim 30)$ °C, relative humidity not more than 85%.

4.2.1 UV-Vis spectrophotometer

The wavelength range is not less than $(360\sim 1100)$ nm, and the technical index is not lower than the requirements of Class II.

4.2.2 Reference material

Cyanide, volatile phenol in water, hexavalent chromium, sulfide, total phosphorus, total nitrogen, ammonia nitrogen, anionic surfactant, etc.

National certified solution reference material, its relative uncertainty is not more than 2%, $k=2$.

4.2.3 Volumetric flask with single marked line and pipette with single marked line. Grade A.

5.1 Wavelength indication error

Take out the matching filter of the flow analyzer colorimeter, put it into the UV-visible spectrophotometer filter after cleaning.

On the light frame, align the center of the filter with the center of the test hole, set the beam bandwidth to 2 nm, and select the appropriate Scanning speed for full-wavelength scanning, draw the transmission characteristic curve of the filter, calculate its central wavelength, and repeat the measurement 3 times, take the average value of the central wavelength as the measured value of the filter wavelength, and calculate the indicated value of the filter

wavelength according to formula (1)

5.2 Measuring linearity

According to the calibration requirements, select the corresponding standard substance in 4.2.2, and dilute it to the initial concentration as shown in Table 1 for the corresponding measurement.

3 times the detection limit of the quantitative components, the range is about two orders of magnitude, a series of standard solutions with 5 concentrations evenly distributed. Will the parameters of the instrument were adjusted to the best working condition, and the blank solution and the series of standard solutions were measured repeatedly three times.

After taking the arithmetic mean of the measured values, obtain the correlation coefficient r of the calibration curve according to the linear regression method.

5.3 Detection limit

Select the initial concentration standard solution in 5.2 as the measurement point, repeat the measurement 10 times, and record the measured value of the instrument.

value, according to formula (2) and formula (3) to calculate the detection limit DL of the instrument.

5.4 Measuring Repeatability

In the normal working state of the instrument, select the middle concentration of the series of standard solutions in 5.2 as the measurement point, and repeat the measurement.

Measure 7 times, record the measured value of the instrument, and calculate the relative standard deviation according to formula (4).

6 Calibration result expression

Calibration results should be reflected on the calibration certificate or calibration report. Calibration certificates should include at least the following information.

- a) Title. "Calibration Certificate" or "Calibration Report";
- b) laboratory name and address;
- c) the place where the calibration is performed (if not performed in a laboratory);
- d) The unique identification (such as number) of the certificate or report, the identification of each page and the total number of pages;
- e) The name and address of the sending unit;
- f) The description and clear identification of the school object;

- g) the date on which the calibration was performed, and if relevant to the validity and application of the calibration results, the date of receipt of the object to be calibrated;
- h) identification of the technical specification on which the calibration is based, including name and code;
- i) Description of the traceability and validity of the measurement standards used for calibration;
- j) description of the calibration environment;
- k) Explanation of calibration results and measurement uncertainty;
- l) a description of the deviation from the calibration specification;
- m) the signature, title or equivalent identification of the issuer of the calibration certificate or calibration report;
- n) A statement that the calibration results are only valid for the subject being calibrated;
- o) Statements of calibration certificates or calibration reports shall not be reproduced in part without the written approval of the laboratory.

7 Recalibration interval

It is recommended that the time interval between re-schooling should generally not exceed 1 year.

Since the length of the recalibration interval is determined by various factors such as the use of the instrument, the user, and the quality of the instrument itself, etc.

Therefore, the sending unit can also independently decide the time interval for re-calibration according to the actual usage.