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**Calibration Specification for Water Quality Online Analyzers of
Heavy Metals
(English Translation)**

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1 Scope

This specification is applicable to the measurement of lead (Pb), cadmium (Cd), mercury (Hg), arsenic (As), chromium (Cr), copper (Cu), Calibration of water quality online analyzers for zinc (Zn), nickel (Ni), iron (Fe), manganese (Mn) and other heavy metal elements, the rest Calibration of heavy metal element water quality online analyzer can refer to this specification.

2.1 Memory Effect

Also called residual effect. The impact of the instrument on the next measurement result after the measurement of a certain standard solution or water sample is completed.

3 Overview

The heavy metal water quality online analyzer (hereinafter referred to as the instrument) is used to automatically measure surface water, groundwater, drinking water, the content of heavy metal elements in water bodies such as domestic sewage and industrial wastewater.

The measurement methods of the instrument mainly include spectrophotometry and anodic stripping voltammetry. Principle of spectrophotometry. water sample passes through After pretreatment, the heavy metal ions in it react with the indicator to develop color, and the

value of absorbance at a specific wavelength is measured to heavy metal content. The principle of anodic stripping voltammetry. After the water sample is pretreated, it is subjected to constant potential electrolysis at an appropriate voltage.

solution, so that the measured heavy metal ions are reduced and enriched on the cathode, and then a reverse scanning voltage is applied on the two electrodes to make the electrodes Heavy metals are oxidized and dissolved, and the peak current formed is proportional to the concentration of heavy metals; when multiple metal ions coexist, according to the magnitude of the electrolysis voltage enriches the stripping in turn, and a variety of metal ions can be measured simultaneously through the anodic stripping voltammetry curve.

The instrument is mainly composed of sampling system, water sample processing system, detection system and data acquisition, processing, Display, transmission system and other components.

According to different application occasions, the instruments are divided into Type I and Type II. Type I instruments are mainly used for surface water, ground water, and drinking water.

For the monitoring of water samples such as water, the type II instrument is mainly used for the monitoring of water samples such as domestic sewage and industrial wastewater.

4 Metrological characteristics

The metrological characteristics of Type I and Type II instruments are shown in Table 1.

5.1 Environmental conditions

5.1.1

Ambient temperature. (5~40)°C, the temperature change during calibration shall not exceed $\pm 5^{\circ}\text{C}$.

5.1.2

Relative humidity. $\leq 85\%$.

5.1.3

Power supply. AC (220 $\pm$ 22)V, (50 $\pm$ 0.5)Hz.

5.2 Measuring instruments and supporting equipment for calibration

5.2.1

Certified reference materials for heavy metals in water. the relative expanded uncertainty is not more than 2% ($k=2$), See Appendix A for the preparation method of the standard solution.

5.2.2

Single-marked pipette and volumetric flask. Grade A.

6.1 Calibration of the instrument

After the instrument is preheated and stabilized, follow the requirements of the instrument instruction manual, the actual setting range and Calibration of the instrument is required for use.

6.2 Detection limit

The standard solution with the concentration shown in Table 2 was passed into the standard sample injection tube for measurement, and the sample injection was repeated for 6 times.

Formula (1) calculates the standard deviation of 6 measurements, and calculates the detection limit of the instrument according to formula (2).

7 Calibration result expression

Calibration results should be reflected on the calibration certificate, which should include at least the following information.

- a) Title. such as "Calibration Certificate";
- b) laboratory name and address;
- c) the location where the calibration was performed (if different from the address of the laboratory);
- d) The unique identification of the certificate (such as number), the identification of each page and the total number of pages;
- e) the customer's name and address;
- f) The description and clear identification of the school object;
- g) The date on which the calibration was performed, if relevant to the validity and application of the calibration results, should indicate the date of the calibration object date of receipt;
- h) If relevant to the validity and application of the calibration results, the sampling procedure for the sample to be calibrated shall be explained;
- i) Identification of the technical specification on which the calibration is based, including name and code;
- j) Description of the traceability and validity of the measurement standards used in this

calibration;

k) description of the calibration environment;

l) a statement of the calibration results and their measurement uncertainties;

m) deviations from calibration specifications;

n) The signature, title or equivalent identification of the issuer of the calibration certificate or calibration report, and the date of issue;

o) A statement that the calibration results are only valid for the subject being calibrated;

p) The statement of the certificate shall not be reproduced in part without the written approval of the laboratory.

8 Recalibration interval

The recalibration interval of the instrument is recommended to be 1 year. Since the length of the recalibration interval is determined by the use of the instrument, it is determined by various factors such as the user and the quality of the instrument itself, so the sending unit can decide independently according to the actual use Recalibration interval. If there is any doubt about the test data of the instrument or the main parts of the instrument are replaced or repaired, the instrument should be recalibrated.

Appendix A

Standard solution preparation method A.1 Blank water for test Use deionized water or pure water that meets the requirements for secondary water in analytical laboratories.

A.2 Certified Reference Materials for Heavy Metals in Water the relative expanded uncertainty is no more than 2% ($k=2$).

A.3 Dilution method

Dilution was carried out using the certified reference material certificate or the method recommended by the instrument manufacturer.

A.4 Preparation of heavy metal standard solution According to the concentration and dosage of the heavy metal standard solution required for calibration and the concentration of the certified heavy metal standard substance used, prepare Prepare heavy metal standard solutions for calibration. For example, accurately pipette 100mg/L water with a 1mL A-grade single-marked pipette Cadmium component standard substance, placed in a 100mL A grade volumetric flask, diluted to the mark with 2% HNO₃ dilution medium, Dilute to volume and shake well to obtain 100mL standard solution of cadmium in water with a concentration of 1.0mg/L.

Heavy metal standard solutions should be prepared and used immediately.