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ENVIRONMENTAL PROTECTION INDUSTRY STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA

HJ/T 99-2003

The Technical Requirement for Water Quality Automatic Analyzer of Dissolved Oxygen (DO)

溶解氧（DO）水质自动分析仪技术要求

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The Technical Requirement for Water Quality Automatic Analyzer of Dissolved Oxygen (DO)

1 Scope

This Standard specifies the technical performance requirements and performance test methods of electrode method-based dissolved oxygen (DO) (0 ~ 35 °C) water quality automatic analyzer for surface water, industrial sewage and municipal sewage.

2 Normative References

Through the reference in this Standard, the clauses of the following documents become clauses of this Standard. In terms of references with a specified date, all the subsequent modification sheets (excluding the corrected content) or revised versions are not applicable to this Standard. However, the various parties that reach an agreement in accordance with this Standard are encouraged to explore the possibility of adopting the latest version of these documents. In terms of references without a specified date, the latest version is applicable to this Standard.

GB 11913-89 *Water Quality - Determination of Dissolved Oxygen - Electrochemical Probe Method*

3 Terms and Definitions

The following terms and definitions are applicable to this Standard.

3.1 Test Specimen

Test specimen refers to surface water, industrial sewage and municipal sewage imported into the automatic analyzer.

3.2 Calibration Solution

Calibration solution is prepared to obtain the same indicated value as the DO concentration of the specimen. There are several types of calibration solution as follows.

3.2.1 Zero-point calibration solution.

3.2.2 Measuring range calibration solution.

or flickers, etc.

7.1.7 The words, symbols and markings describing the functions shall comply with the stipulations of "9 Marking" of this Standard.

7.2 Composition: DO automatic analyzer is composed of detection unit, display and recording unit, data processing and signal transmission unit, etc.

7.3 Sampling part: it shall have a complete and air-tight sampling system.

7.4 Measurement unit refers to the immersion of the electrode in the specimen and the stable transmission of the generated signal to the display and recording unit. It is composed of electrode supporting part and converter, etc.

7.4.1 Electrode is composed of anode, cathode, thermometer and electrolyte, etc. Use an oxygen-permeable film (such as: fluororesin, polyethylene, silicone rubber, etc.) to cover the electrode. It has a structure, in which, the specimen does not directly contact with the anode and the cathode.

7.4.2 The electrode supporting part refers to electrode sleeves used for electrode fixation. It is made of stainless steel, rigid polyvinyl chloride, polypropylene and other materials that would not be corroded by the specimen.

7.4.3 Converter and display: they shall have a water-proof structure; the distance between the electrode and the converter shall be as short as possible.

7.5 Display and recording unit: it shall have the function of displaying, recording and printing dissolved oxygen concentration (mg/L) in equal division and the digital form.

7.6 Data transmission unit: it shall have a complete data collection and transmission system.

7.7 Auxiliary devices: in accordance with the demands, the automatic analyzer may be equipped with the following auxiliary devices.

7.7.1 Electrode cleaning device: it refers to a cleaning device, which uses fluids like water and air, to clean the electrode.

7.7.2 Automatic water collection device: it refers to a device that automatically collects specimens and transmits it to the electrode at a certain flow rate.

8 Inspection Methods

8.1 Test Conditions

8.1.1 Ambient temperature: between 10 ~ 40 °C; during the test, the temperature variation is within ± 5 °C/d.

specified by the manufacturer.

8.2.3.3 Adjustment: alternately perform zero-point calibration and measuring range calibration operations; adjust the analyzer, until the difference between the determined value of the calibration solution and the displayed value is within ± 0.25 mg/L.

8.3 Performance Test Methods

8.3.1 Repeatability error: under the test conditions of 7.1, immerse the electrode in the measuring range calibration solution; while using a magnetic stirrer to stir it, continuously determine it for 6 times. Record each determined value; calculate the relative standard deviation.

8.3.2 Zero drift: adopt the zero-point calibration solution to continuously determine for 24 h. Use the initial zero value (the average value of the first 3 determined values) within this period of time to calculate the percentage of the difference between the maximum variation amplitude and the initial zero value relative to the measuring range value.

8.3.3 Measuring range drift: adopt the measuring range calibration solution; before and after the zero drift test, while using a magnetic stirrer to stir it, respectively determine 3 times; calculate the average value. Through the variation amplitude after subtracting the zero drift component, calculate the percentage relative to the measuring range value.

8.3.4 Response time: transfer the electrode from the measuring range calibration solution to the zero-point calibration solution; determine the time required when the displayed value reaches 1 mg/L.

8.3.5 Temperature compensation accuracy: respectively at (20 ± 0.5) °C and (30 ± 0.5) °C, prepare saturated dissolved oxygen solution. Respectively immerse the electrode in the above-mentioned solutions; while using a magnetic stirrer to stir it, read the respective indicated values (mg/L). Respectively determine the temperature of the above-mentioned solutions (accurate to ± 1 °C). In accordance with the determined results, obtain the difference of saturated dissolved oxygen concentrations in Attached Table 1.

8.3.6 Mean time between failures: use actual water samples; continuously run for 2 months; record the total running time (h) and the number of failures (number of times); calculate the mean time between failures (MTBF) ≥ 720 h/number of times (this indicator may be evaluated on site).

8.3.7 Actual water sample comparison test: select 5 (or more) actual water samples; respectively conduct comparison tests of three concentration levels (high, medium and low) of each water sample through the automatic analyzer and the method in the national standard (GB 11894-89). The number of the comparison tests for each water

10 Operating Instructions

In the operating instructions, at least the following related matters must be explained.

10.1 Selection of installation location.

10.2 Flow rate of specimen.

10.3 Piping and wiring.

10.4 Warm-up time.

10.5 Method of application.

10.5.1 Determination preparation and calibration method.

10.5.2 Calibration solution preparation method.

10.5.3 Method of determination operation.

10.5.4 Disposal when the determination is suspended.

10.6 Maintenance and inspection.

10.6.1 Daily inspection method.

10.6.2 Regular inspection method.

10.6.3 Cleaning of electrode system.

10.6.4 Countermeasures in case of failure.

10.7 Other matters needing attention during use.

11 Validation

11.1 Daily validation: the calibration cycle of reproducibility, drift and response time is on-site validation at least once a month, which may be conducted automatically or manually.

11.2 Supervisory validation: the installed continuous monitoring system must be periodically validated; the results of the periodic validation shall be reported and submitted to the corresponding administrative department on environmental protection. The periodic validation shall be undertaken by a monitoring institution with corresponding qualifications.

Periodic validation mainly includes: on-site comparison tests conducted in accordance

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