HJ

NATIONAL ENVIRONMENTAL PROTECTION STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

HJ 377-2019

Replacing HJ/T 377-2007

Technical specifications and test procedures for water quality on-line automatic monitoring equipment of chemical oxygen demand (COD_{Cr})

化学需氧量（COD_{Cr}）水质在线自动监测仪技术要求及检测方法

Issued on: December 24, 2019 **Implemented on: March 24, 2020**

Issued by: Ministry of Ecology and Environment

Table of Contents

Technical specifications and test procedures for water quality on-line automatic monitoring equipment of chemical oxygen demand (COD_{Cr})

1 Scope

This Standard specifies technical specifications, performance indicators and test procedures for water quality on-line automatic monitoring equipment of chemical oxygen demand (COD_{Cr}).

This Standard is applicable to guide production design, guide application type selection and conduction of performance inspection of water quality on-line automatic monitoring equipment of chemical oxygen demand (COD_{Cr}) for surface water, domestic sewage and industrial wastewater.

The measurement range of water quality on-line automatic monitoring equipment of chemical oxygen demand (COD_{Cr}) shall include 15mg/L~2000mg/L ($\rho(Cl^-)$ ≤2000mg/L). It shall be able to meet monitoring requirements for surface water, domestic sewage and industrial wastewater.

2 Normative references

The following documents contain the provisions which, through reference in this Standard, become the provisions of this Standard. For undated reference documents, the latest versions apply to this Standard.

GB/T 9969, *General Principles for Preparation of Instructions for Use of Industrial Products*

GB/T 13306, *Plate*

HJ 212, *Data transmission standard for online monitoring systems of pollutant*

HJ 828, *Water quality - Determination of the chemical oxygen demand - Dichromate method*

HJ/T 70, *High-chlorine wastewater - Determination of chemical oxygen demand - Chlorine emendation method*

concentration standard solution that continuously measures the concentration at the specified period (80%~100%) as the upper limit of test range, the measured value of instrument and the initial value without unplanned manual maintenance and calibration of instrument TO the upper limit of test range.

3.9 memory effect

The degree of influence of residues in the instrument pipeline on the next measurement result after the instrument completes the measurement of a standard solution or sample.

3.10 interference of voltage

The deviation BETWEEN the measured value of the same standard solution under different power supply voltages AND the measured value at the standard power supply voltage (220V).

3.11 interference of chloridion

The deviation BETWEEN the measured value of the standard solution that contains chloridion AND the measured value of the standard solution that contains no chloridion.

3.12 interference of environmental temperature

The deviation BETWEEN the measured value of the same standard solution at different ambient temperatures AND the measured value at 20°C.

3.13 minimum period between maintenance operations

Total operating time (hours) that during the test process, no manual maintenance of the instrument is required (including replacement of reagents, calibration of instrument) until the instrument cannot maintain the normal measurement state or the performance indicators do not meet relevant requirements.

3.14 data availability

The percentage of actual valid data relative to the total data that shall be obtained, during the entire instrument test cycle.

3.15 conformity

Parallelism of measured values of multiple instruments under the same test conditions.

3.16 running record

Referring to working parameters that are automatically recorded by instrument

and reagents.

Digestion unit: use appropriate digestion methods and strong oxidants to oxidize the organic and inorganic reducing substances in water samples to corresponding required functional units.

Analysis and test unit: consisting of reaction modules and test modules. Through the control unit, complete the automatic online analysis on the substances to be tested and convert the measured value to the part of electrical signal output.

Control unit: including system control hardware and software, the part to realize operations such as sample injection, digestion and liquid drainage. It has functions such as data collection, processing, display storage, security management, data and operation log query output, as well as output sample retention and trigger sampling at the same time. When the control unit realizes the above functions, it shall be able to provide corresponding communication protocol and the corresponding communication protocol shall meet the requirements of HJ 212.

4.2 Environmental conditions for use

Ambient temperature: 5°C~40°C;

Relative humidity: 65% ± 20%;

Power supply voltage: AC voltage 220V ± 22V;

Power frequency: 50Hz ± 0.5Hz;

Water sample temperature: 0°C~50°C.

4.3 Appearance requirements

4.3.1 The instrument marks shall meet the requirements specified in GB/T 13306. The signs shall be fixed in appropriate places. On the fixed signs, the following information shall be contained:

a) Power category;

b) Manufacturer name and address;

c) Instrument name, model;

d) Exit-factory No.;

e) Date of manufacture;

f) Scope of measuring range;

4.4.5.9 The unit of instrument measurement result is mg/L. Keep one digit after decimal point.

4.4.5.10 There shall be digital communication interfaces. Through digital communication interfaces, it outputs instruction, related data and running record. It shall be able to receive remote control instructions from management platform, at least containing remote start, remote time synchronization functions.

4.4.5.11 The data transmission shall provide communication protocol and meet the requirements of HJ 212.

4.4.5.12 It shall realize the serial output and network output of monitoring data.

4.4.5.13 It shall have abnormal information recording, uploading and feedback functions, at least including: reagent shortage alarm, component failure alarm, liquid leakage alarm, sampling failure alarm and over-standard alarm.

4.4.5.14 It shall have the function that when the power is accidentally cut off and re-energized, the water samples and reagents being measured before the power off can be automatically discharged, the channels can be automatically cleaned, and the test can be automatically reset to restart the test. If it is in the state of heating and digestion before power off, it shall automatically cool down after it is powered on again and automatically reset to the state to restart the test. All system setting data, including calibration data, alarm data and operating data, shall not change when the power is reconnected within 30d of power failure.

4.4.5.15 It shall have three levels of operation management authority. Level one is query authority, which can only query parameters and data. Level two is management authority, which can perform maintenance and repair operations such as calibration, cleaning, and instrument parameter setting. Level three is developer authority, which can modify the instrument kernel.

4.4.5.16 It shall have the function to collect, store the waste liquid of analysis and the cleaning wastewater. Process according to the management requirements.

5 Performance indicators and test methods

5.1 Performance indicators

Within the basic test range of which the concentration value of chemical oxygen demand (COD_{Cr}) is 15mg/L~200mg/L, conduct the test according to the method specified in 5.5 of this Standard. The performances of water quality on-line automatic monitoring equipment of chemical oxygen demand (COD_{Cr}) must meet the requirements of Table 1.

5.3 Reagents

5.3.1 Experimental water: distilled water without reducing substances that is obtained according to the method of HJ 828.

5.3.2 Chemical oxygen demand (COD_{Cr}) standard stock solution: ρ = 2000.0mg/L.

Weigh 1.7004g of potassium hydrogen phthalate ($KHC_8H_4O_4$, premium grade) that is dried at 120°C for 2h and cooled to constant weight. Dissolve in an appropriate amount of water. Move into a 1000mL volumetric flask. Dilute to the scale. This solution is stored at 2°C~5°C. It can be stored stably for one month.

Other low-density chemical oxygen demand (COD_{Cr}) standard solutions are obtained from the chemical oxygen demand (COD_{Cr}) standard stock solution after stepwise dilution.

5.3.3 Sodium chloride (NaCl), analytical reagent.

Place sodium chloride in a porcelain crucible. Burn 40min~50min at 500°C~600°C. Cool in a dryer for use.

5.4 Test preparation and calibration

5.4.1 Check each part of the instrument. Adjust the instrument to normal working state.

5.4.2 Check each reagent of the instrument. Ensure it sufficient and meet quality requirements.

5.4.3 After connecting the power supply, perform warm-up operation according to the warm-up time specified in the operating instructions provided by the instrument manufacturer, so as to stabilize the function of each part.

5.4.4 According to the calibration method specified in the operating instructions provided by the instrument manufacturer, use chemical oxygen demand (COD_{Cr}) standard stock solution (5.3.2) to prepare the standard solution of the concentration specified by the instrument to calibrate.

5.5 Test methods of basic test range

5.5.1 Indication error

During normal instrument operation, respectively measure three standard solutions of which the chemical oxygen demand (COD_{Cr}) concentration values are approximately 40mg/L, 100mg/L, 160mg/L. Continuously measure n (n=6) times for each solution, the relative error of the average value of measured values of n (n=6) times TO mass concentration value of standard solution.

value ($\overline{a}$) of absolute value of absolute error of water sample. See formula (12) for the calculation method.

$$\overline{a} = \frac{\sum_{i=1}^{n} \left| X_i - \overline{B} \right|}{n} \qquad (12)$$

Where,

$\overline{A}$ - Average of absolute value of relative error of water sample, %;

$\overline{a}$ - Average of absolute value of absolute error of water sample, mg/L;

X_i - The i^{th} measured value of test water sample of the water quality on-line automatic monitoring equipment of chemical oxygen demand (COD_{Cr}), mg/L;

$\overline{B}$ - Average value of test water sample according to manual method, mg/L;

n - Number of measurements of water sample of the water quality on-line automatic monitoring equipment of chemical oxygen demand (COD_{Cr});

i - The i^{th} measurement water sample of the water quality on-line automatic monitoring equipment of chemical oxygen demand (COD_{Cr}).

5.5.11 Minimum maintenance cycle

During the entire instrument test cycle, the interval between any two maintenances of the instrument (including dumping of waste liquid, adding reagents, changing the measuring range and other maintenance) shall be ≥168h.

5.5.12 Data availability

During the entire instrument test cycle, the available data are:

a) When the instrument is testing the items specified in this Standard (excluding interference of environmental temperature), the displayed value of the operating measurement meets the requirements of the indicators (excluding the data availability indicator) in Table 1 of this Standard;

b) When the instrument is not testing the items not specified in this Standard, the instrument shall determine a specific concentration of standard

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------