

JJG 291-2008

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JJF

**National Metrology Technical Specifications
of the People's Republic of China**

JJG 291-2008

**Dissolved Oxygen Meter with Covered-Membrane-
Electrode**

覆膜电极溶解氧测定仪

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JJG 291-2008

**Verification Regulation of Dissolved Oxygen
Meter with Covered-Membrane-Electrode**

JJG 291-2008
Replacing **JJG 291-1999**

This regulation was approved by General Administration of Quality Supervision, Inspection and Quarantine on December 23, 2008 and shall be implemented from June 23, 2009.

Jurisdictional organization:

National Technical Committee on Environmental Stoichiometry

Drafting organization:

Zhejiang Province Institute of Metrology

This regulation is entrusted to and shall be responsibly interpreted by National Technical Committee on Environmental Stoichiometry.

JJG 291-2008

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Dissolved Oxygen Meter with Covered-Membrane-Electrode

1 Scope

This regulation applies to initial verification, subsequent verification and in-use verification of laboratory-service and portable dissolved oxygen meters with covered-membrane-electrode (hereinafter referred to as the instrument) that have a measuring range of (0 ~ 20)mg/L.

2 Overview

The instrument is used to measure concentration of constant dissolved oxygen meter (DO) in water.

The instrument is composed of covered-membrane-oxygen electrode, electronic unit and displayer.

3 Requirements for metrological performance

3.1 Zero error

Zero error of instrument shall not exceed 0.10 mg/L.

3.2 Response time

Response time of instrument shall not exceed 60 s.

3.3 Dissolved oxygen concentration indication error

Dissolved oxygen concentration indication error of instrument for initial verification shall not exceed ± 0.30 mg/L; indication error for subsequent verification shall not exceed ± 0.50 mg/L.

3.4 Repeatability

Standard deviation of instrument for initial verification shall not exceed 0.15 mg/L; standard deviation for subsequent verification shall not exceed 0.20 mg/L.

3.5 Temperature indication error

Temperature indication error of instrument shall not exceed $\pm 0.5^{\circ}\text{C}$.

3.6 Salinity compensation error

Salinity compensation error of instrument shall not exceed $\pm 2\%$.

4 General technical requirements

4.1 Appearance

4.1.1 The instrument shall indicate the name of manufacturing company, model and manufacturing number; domestic instrument shall be marked with metering equipment

referring to Annex D, in Pa. Take Δc with maximum absolute value as dissolved oxygen concentration indication error.

5.3.7 Verification of repeatability

5.3.7.1 Verification of repeatability of instrument shall be carried out in saturated dissolved oxygen water that thermostatic water batch is close to the room temperature.

5.3.7.2 Measure table saturated dissolved oxygen water for continuous 6 times; record 5.3 Verification method

5.3.1 Appearance

Check through vision or hand feeling according to requirements of 4.1.

5.3.2 Verification of insulation resistance

The instrument is not connected to power source. Turn on the power switch. Connect one end of insulation resistance meter to the phase of instrument input terminal and neutral conjunction line, while connect the other end to protective earth terminal (or shell) of the instrument. Apply test voltage of 500 V and continue for 5 s; measure insulation resistance.

5.3.3 Verification of dielectric strength

The instrument is not connected to power source. Turn on the power switch. Connect two measuring lines of dielectric strength tester to phase of power input terminal, central conjunction line and ground terminal (or shell). Apply test voltage of 1 500 V; set leak current to be 5 mA and lifting time to be (5s to 20)s; keep for 1 min, and then lower the voltage to 0 V stably. There shall be no breakdown and arcing phenomena during the test process.

5.3.4 Verification zero error

5.3.4.1 Calibrate normally according to the requirements of operation instruction of instrument.

5.3.4.2 Immerse electrode into freshly prepared oxygen-free solution at a temperature of $(20 \pm 5)^{\circ}\text{C}$ from air; see A.1 in Annex A for preparation of anaerobic water.

5.3.4.3 Instrument indication after 5 min is just the zero error caused by zero bit current.

5.3.5 Verification of response time

5.3.5.1 Control thermostatic water bath temperature to $(20 \pm 1)^{\circ}\text{C}$; prepare saturated dissolved oxygen water according to requirements in A.2 of Annex A.

5.3.5.2 Take electrode out of thermostatic water bath and immerse into oxygen-free water quickly; meanwhile start timing.

5.3.5.3 Stop timing when the instrument displays 90% stable value; the reading of stopwatch is just the response time.

5.3.6 Verification of dissolved oxygen concentration indication error

5.3.6.1 Re-calibrate the instrument.

instrument according to Formula (4):

$$\Delta T = T_i - T_s \dots \dots \dots (4)$$

Where,

T_i - Instrument indication temperature value, in °C;

T_s - Reading of precision thermometer, in °C.

Take ΔT with maximum absolute value as instrument temperature indication error of instrument.

5.3.9 Verification of salinity compensation error

5.3.9.1 Pour 1 L of distilled water into the beaker; place it into thermostatic water bath at a temperature of $(15 \pm 0.2)^\circ\text{C}$; stop bubbling 1 h after the start; still for 10 min and measure concentration N_0 of dissolved oxygen concentration with zero salt. Standard value of water dissolved oxygen concentration that salt content is $n(\text{g/L})$ is obtained according to Formula (5):

$$N_{sn} = N_0 - 0.055 \ 9 \ n \dots \dots \dots (5)$$

Where,

n - Salt (NaCl) in grams, n may be 10g, 20g and 30g.

Note: 0.055 9 refers to the variation of solubility when water temperature is 15°C and salt content is 1 g/L (ΔCs). See Annex A of GB/T 11913- 1989.

5.3.9.2 Maintain pure water temperature 15°C ; add salt of 10 g and stir uniformly; prepare it to be saturated dissolved oxygen water that salt content is 10 g/L and measure to get N_{10} (measure for 2 times and take the average value). Use the same method to prepare water into saturated dissolved oxygen water that salt content is 20, 30 g/L and measure to get N_{20} and N_{30} respectively. Calculate salinity compensation error according to Formula (6):

$$\Delta N = \frac{N_n - N_{sn}}{N_{sn}} \times 100\% \dots \dots \dots (6)$$

Where,

N_n - Concentration of saline dissolved oxygen, which may be N_{10} , N_{20} , N_{30} , in mg/L.

Take the ΔN with the maximum absolute value as salinity compensation error of instrument.

5.4 Verification results handling

5.4.1 In case of poor electrode performance discovered during verification process, it is allowed to replace electrode electrolyte and membrane; re-verification is required after the replacement.

5.4.2 Issue verification qualification certificate for instruments that are verified qualified according to this regulation. For disqualified instruments, issue notice of verification results,

Annex F

Format of Verification Certificate and Note of Verification Result (Inner Page)

F.1 Format of verification certificate (inner pages)

Verification Item	Technical Requirements	Verification Results
Appearance		
Zero error		
Insulation resistance		
Dielectric strength		
Response time		
Dissolved oxygen concentration indication error		
Repeatability		
Temperature indication error		
Salinity compensation error		

F.2 Format of notice of verification result (inner pages)

Verification Item	Technical Requirements	Technical Results	Conclusion of Single Item
Appearance			
Insulation resistance			
Dielectric strength			
Zero error			
Response time			
Dissolved oxygen indication error			
Repeatability			
Temperature indication error			
Salinity compensation error			
Disqualified item:			

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