

# JJG

## INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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#### Verification Regulation of Gas Chromatograph (English Translation)

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### 1 Scope

This Regulation applies to the initial verification, subsequent verification, and in-use inspection of gas chromatographs equipped with thermal conductivity detectors (TCD), flame ionization detectors (FID), flame photometric detectors (FPD), electron capture detectors (ECD), and nitrogen-phosphorus detectors (NPD).

### 2 Overview

A gas chromatograph (hereinafter referred to as the instrument) is an instrument that uses a carrier gas to carry a sample into a chromatographic column; separates the components in the sample by utilizing the different distribution and adsorption coefficients between the gas phase and the stationary phase in the chromatographic column; and detects them using a detector.

Qualitative and quantitative analysis is performed based on the retention time and response value of each component.

The instrument consists of a gas path system, an injection system, a separation system, a temperature control system, a detection system, and a data processing system.

### **3 Metrological Performance Requirements**

The metrological performance of the instrument shall meet the requirements in Table 1.

#### **4.1 Appearance**

The instrument shall be free from damage that would affect its normal operation. All switches, knobs, or buttons shall operate and control normally; and indicator lights shall display clearly and correctly. The instrument shall be marked with the manufacturer's name, model, serial number, and manufacturing date. Domestically produced instruments shall be marked with a manufacturing license mark and serial number for measuring apparatus.

#### **4.2 Gas path system**

Under normal operating conditions, all gas connections from the gas source to the instrument shall be checked with a leak test solution; and there shall be no leaks.

### **5 Measuring Apparatus Control**

Measuring apparatus control of the instrument includes initial verification, subsequent verification, and in-use inspection.

#### **5.1.1 Verification environmental conditions**

Ambient temperature. (5~35) °C, relative humidity. (20~85) %. Flammable, explosive, and highly corrosive substances unrelated to the experiment shall not be stored indoors. There shall be no mechanical vibration or electromagnetic interference.

#### **5.1.2 Instrument installation requirements**

The instrument shall be placed stably and securely on the workbench. Cable connectors shall fit tightly and be properly grounded. Stainless steel or copper tubing is recommended for gas pipelines (carrier gas and oxidant gas).

#### **5.1.3 Carrier gas, fuel gas, and oxidant gas**

The purity of the carrier gas shall meet the instrument's requirements, generally no less than

99.995%. The fuel gas and oxidant gas shall not contain substances that could affect the normal operation of the instrument.

## 5.2 Standard substances and equipment for verification

The standard substances used for verification shall be certified standard substances approved and issued by the national metrology administration department. Verification equipment needs to be verified and certified by a metrology technical institution.

### 5.2.1 Standard substances

See Table 2 for standard substances used for verification.

using a micro-syringe. Measure continuously 7 times and record the benzene peak area.

Using gas standard substance for verification.

According to the verification conditions in Table 4, introduce a methane gas standard substance with a mole fraction of (100~10,000)  $\mu\text{mol/mol}$ . Measure continuously 7 times and record the methane peak area.

Sensitivity is calculated using Formula (3).

Where.

STCD - TCD sensitivity, in  $\text{mV} \cdot \text{mL/mg}$ ;

A - arithmetic mean of the peak area of benzene or methane, in  $\text{mV} \cdot \text{min}$ ;

W - sample injection amount of benzene or methane, in  $\text{mg}$ ;

Fc - carrier gas flow rate after correction, in  $\text{mL/min}$ .

The correction of carrier gas flow rate can refer to Appendix A.

### 5.4.4.2 Electron capture detector (ECD)

#### 1) Noise and drift

According to the verification conditions in Table 4, record the baseline for 30 min. The signal value corresponding to the peak height of the highest noise peak in the baseline is the instrument's baseline noise; the response signal value with the largest deviation of the baseline from the starting point is the instrument's baseline drift.

#### 2) Limit of detection

According to the verification conditions in Table 4, after the baseline stabilizes, inject (1~2)  $\mu\text{L}$  of a 0.1  $\text{ng}/\mu\text{L}$  of gamma Hexachlorocyclohexane- isooctane solution using a micro-syringe. Measure 7 times consecutively and record the peak area of gamma-hexachlorocyclohexane. The limit of detection is calculated using Formula (4).

Where.

DECD - limit of detection by ECD, in  $\text{g/mL}$ ;

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