

HJ

INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

HJ 693-2014

Stationary Source Emission - Determination of Nitrogen Oxides - Fixed Potential by Electrolysis Method (English Translation)

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1 Scope

This Standard specifies the fixed potential by electrolysis method for determination of nitrogen oxides in stationary source emission.

This Standard is applicable to the determination of nitrogen oxide in the stationary source emission.

The detection limit of this Standard method is 3mg/m³ for nitrogen oxide (calculated by NO₂); 3mg/m³ for nitrogen dioxide; lower limit of determination is 12mg/m³ for nitrogen oxide (calculated by NO₂); 12mg/m³ for nitrogen dioxide.

2 Normative References

The contents of this Standard refer to the following documents or their terms. For the undated references, only the valid version applies to this Standard.

GB/T 16157 The Determination of Particulates and Sampling Methods of Gaseous Pollutants Emitted from Exhaust Gas of Stationary Source

HJ/T 76 Specification and Test Procedures for Continuous Emission Monitoring

Systems of Flue Gas Emitted from Stationary Sources (on Trial)

HJ/T 373 Technical Specifications of Quality Assurance and Quality Control for

Monitoring of Stationary Pollution Source

HJ/T 397 Technical Specifications for Emission Monitoring of Stationary Source

3.1 Nitrogen oxides

It refers to the nitrogen oxides in the form of nitrogen oxide (NO) and nitrogen dioxide (NO₂) in a stationary source emission.

conditions, the following numbers shall be constant numbers such as electron transfer number Z , farad constant F , gas diffusion area S , diffusion constant D , and diffusion layer thickness δ . Therefore, under certain range, the magnitude of the limiting diffusion current, i , is proportional with the concentration (ρ) of NO or NO₂.

5 Interference and Elimination

The particulate matter and moisture in the measured exhaust gas are easily condensed on the surface of the permeable membrane of the sensor; so that influence the determination of the NO and NO₂. Thus, this method uses a dust filter device and a dehumidification cooling device, etc. to pretreat the particulate matter and moisture in the exhaust gas to remove the influence.

The following gases, such as CO₂, NH₃, CO, SO₂, H₂, HCl, CH₄, C₂H₄, shall influence the determination of NO and NO₂ in difference degree; interference between NO and NO₂ shall also occur, if the inference is obvious, it shall be corrected in the calculation program of the instrument.

6.1 Standard gases of nitrogen oxide and nitrogen dioxide

The certified environmental standard gas has an uncertainty of no more than 2%; or the uncertainty currently achievable. Check the standard gas concentration for the calibration error and system bias shall be 40%~60% C.S. or equal to C.S.

6.2 Nitrogen

Purity greater than 99.99%.

7.1.1 Composition

The nitrogen oxide analyzer by fixed potential electrolysis method (hereinafter referred to as: instrument) consists of: main unit (including flow control device, air pump, NO and NO₂ sensors, etc.), sampling tube (including dust filter and heating device), air pipe,

dehumidifying cooling device, portable printer, etc.

rate of the instrument. Use the standard gas to fill with the clean air-collecting bag, then drain it; repeat for 3 times; then fill with it again for later-use. Calibrate according to the calibration steps specified in the instrument instruction manual.

(2) Steel cylinder method: Firstly, use the gas flow meter to calibrate the sampling flow of the instrument. CONNECT the standard gas steel cylinder equipped with pressure reducing valve, adjustable rotameter, air guiding tube WITH sampling tube; open the cylinder gas valve; adjust the rotameter; inject the gas into the inlet of the instrument according to the flow rate specified by the instrument; the indicated value and the specified value of the sampling flow rate of the instrument shall be consistent. Pay attention that each joint shall not leak. Calibrate according to the calibration steps specified in the instrument instruction manual.

9.2.1 Zero calibration

(1) According to the instruction manual of the instrument, correctly connect the instrument's main unit, sampling tube (including dust filter device and heating device), air guiding tube, dehumidifying cooling device, and other devices.

(2) Turn on the power to the heating device, dehumidifying cooling device, and other devices to meet the conditions specified in the instrument's instruction manual.

(3) Turn on the power to the main unit; take the clean ambient air or nitrogen gas as the zero gas to conduct the zero calibration of the instrument.

9.2.2 Sample determination

After the zero-point calibration is completed, place the front end of the sampling tube of the instrument in the exhaust pipe; block the sampling hole, so that it does not leak gas. After the instrument indication is stable, record the indication value; record the monitoring result at least once per minute. Take the average value of 5min~15min as one measurement value. During the measurement period, in order to protect the sensor, after a period of measurement, clean the ambient air or nitrogen cleaning sensor according to the instruction manual of the instrument.

9.3.1 After obtaining the determination results, place the sampling tube int the clean

ambient air or nitrogen to bring the indication value of the instrument back to near zero.

9.3.2 Shut down; cut off the power supply; disassemble the parts of the instrument, the measurement is over.

The relative standard deviations in the laboratory are: 0~1.7%, 0.3%~1.4%,

0.1%~0.7%;

The relative standard deviations among laboratories are: 3.2%, 2.0%, 1.3%;

The repeatability limits are: 2.7mg/m³, 9.2mg/m³, 11.9mg/m³;

The reproducibility limits are: 8.4mg/m³, 20.5mg/m³, 35.1mg/m³.

(2) Determination of NO₂ standard gases at concentrations of 99mg/m³, 201mg/m³, 419mg/m³ in 6 laboratories:

The relative standard deviations in the laboratory are: 0~1.6%, 0%~2.0%,

0.2%~1.1%;

The relative standard deviations among laboratories are: 3.5%, 2.6%, 1.8%;

The repeatability limits are: 2.7mg/m³, 6.4mg/m³, 8.2mg/m³;

The reproducibility limits are: 8.4mg/m³, 13.8mg/m³, 19.7mg/m³.

(3) Six laboratories simultaneously measure the concentration of NO in the exhaust gas from 4#, 6# units of a power plant. The concentration of NO in the exhaust gas from 4# unit is 611mg/m³~646mg/m³; the average value is 631mg/m³; while concentration of NO in the exhaust gas from 6# unit is 168mg/m³~193mg/m³; the average value is 178mg/m³.

The relative standard deviations in the laboratory are: 0.8~2.4%, 1.6%~4.3%;

The relative standard deviations among laboratories are: 2.1%, 4.9%;

The repeatability limits are: 35.5mg/m³, 16.2mg/m³;

The reproducibility limits are: 33.3mg/m³, 22.2mg/m³.

(4) Six laboratories simultaneously measure the concentration of NO₂ in the exhaust gas from certain glass kiln. The concentration of NO₂ in the exhaust gas is

170mg/m³~199mg/m³; the average value is 183mg/m³.

The relative standard deviations in the laboratory are: 3.6%~12.8%;

The relative standard deviations among laboratories are: 6.5%;

The repeatability limits are: 33.3 mg/m³;

The reproducibility limits are: 30.4mg/m³.

12.7 The instrument with the negative pressure resistance greater than the negative

pressure of the exhaust cylinder shall be selected; avoid the reduction of the sampling flow of the instrument, which results in the low or undetectable test results.