

ICS 17.020
CCS A 61

JJF

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

JJF 1567-2016

**Calibration Specification for Phosphate Analyzers
(English Translation)**

Issued on: June 27, 2016

Implemented on: September 27, 2016

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine**

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Introduction

This specification to JJF 1071-2010 "national measurement calibration standard preparation rules", JJF 1001-2011 "General Measurement Terms and Definitions "and JJF

1059.1-2012" Measurement Uncertainty Assessment and Representation "for basic specifications to develop.

In the development of this specification, with reference to the GB/T 6913-2008 "boiler water and cooling water analysis method phosphoric acid Determination of salts "and DL/T 502.13-2006" Water vapor analysis methods for thermal power plants Part 13. Phosphate Determination (spectrophotometric method) "part of the content.

This specification is the first release.

Standard for Phosphate Analyzer Calibration

1 Scope

This specification applies to the calibration of a phosphate analyzer (colorimetric method).

2 reference file

This specification refers to the following documents.

GB/T 6682 Analytical laboratory water specifications and test methods Water vapor analysis methods for thermal power plants - Part 13. Determination of phosphates (points) Photometric method) for dated references, only the dated edition applies to this specification; references that are not dated , The latest version (including all modifications) applies to this specification.

3 Overview

Phosphate analyzer is used to determine the phosphate content of water (represented by PO_4^{3-}). The principle is in the acid in the medium water samples, phosphates form molybdenum vanadium molybdate complexes with molybdate and metavanadate, and then use photoelectric the color principle is measured according to Lambert-Beer's law.

Phosphate analyzer (hereinafter referred to as instrument) mainly by the light source, light collimation unit, sample chamber, signal detection transmission System and display and processing systems and other components. The structure of the diagram shown in Figure 1.

Figure 1 Schematic diagram of the structure of the phosphate analyzer

4 measurement characteristics the instrument performance requirements are shown in Table 1.

Table 1 Phosphate analyzer metering performance requirements

Metrological performance indicators Instrument zero drift (30min) $\pm 0.2\text{mg/L}$ the maximum permissible error of the instrument is $\pm 2\%$ FS Instrument measurement repeatability $\leq 1\%$

Table 1 (continued)

Metrological performance indicators Instrument indication stability (30min) $\pm 1\%$ FS Note.
All of the above indicators are not used for qualifying, only reference.

5 calibration conditions

5.1 Environmental conditions

5.1.1 Ambient temperature. (15 ~ 35) °C

5.1.2 Relative humidity. not more than 85%

5.1.3 Power supply. voltage (220 $\pm$ 22) V, frequency (50 $\pm$ 0.5) Hz, or meet the requirements of the instrument.

5.2 Measurement standards and other equipment

5.2.1 Determination of phosphate composition in water Standard substance. A national standard material should be used, relative expansion uncertainty Better than 1.0% (k = 2).

5.2.2 Stopwatch. Minimum scale value 0.1s.

5.2.3 glass measuring device. single-line capacity bottle 1000mL, single-line pipette 10mL, are A-level.

Above the use of measuring instruments should be effective traceability.

6 calibration items and calibration methods

6.1 Instrument zero drift Until the instrument boot warm-up stability, in normal working condition, with deionized water to clean the instrument sample pool, and to go Ion water as a zero solution, color reaction after injection into the sample pool, record the initial value of the instrument c_0 . After every 5min remember Recorded instrument indication c_{0i} , continuous observation 30min, according to formula (1) calculated zero drift, take the absolute value of the maximum Δc_0 for the instrument Zero drift.

$\Delta c_0 = c_{0i} - c_0$ (1) where.

Δc_0 --- instrument zero drift, mg/L;

c_{0i} --- instrument i show, mg/L;

c_0 --- initial value of the instrument, mg/L.

6.2 Instrument indication error when the instrument is warmed up, it is in the normal working condition and the instrument is carried out according to the instruction manual.

quasi. Within the calibration range of the instrument, 20%, 40%, 80% of the corresponding phosphate concentration Solution, after the color reaction followed by injection into the instrument sample pool, each concentration point measurement 3 times, record the instrument indication. press Equation (2) calculates the indication error Δc for each concentration point. For other ranges of multi-range instruments, refer to the above method

to calibrate.

$\Delta c =$

$c - c_s$

$R \times 100\%$

Where.

Δc --- instrument indication error, %;

c - the average of the three measurements of the instrument, mg/L;

c_s --- standard value of phosphate solution, mg/L;

R --- Instrument calibration range, mg/L.

6.3 Instrument measurement repeatability Until the instrument boot warm-up stability, in the normal working condition, select the instrument range of 80% concentration of phosphate concentration Standard solution, the color reaction into the instrument after the sample pool, continuous measurement 6 times, read the instrument display, according to type (3) Calculate its repeatability Δc .

$\Delta c =$

$(c_i - c) \sqrt{2}$

$100\% (n-1)$

Where.

Δc - instrument measurement repeatability, %;

c_i --- the instrument measured the first i , mg/L;

c - the average of the 6 measurements, mg/L;

n - number of measurements, $n = 6$.

6.4 Instrument indication stability to be instrumented preheat stable, in normal working condition, with deionized water to clean the instrument sample pool, optional instrument Range of 80% concentration of phosphate standard solution, the color reaction into the instrument after the sample pool, record the initial value of the instrument c_D .

After every 5min record instrument indication c_{Di} , continuous observation 30min, according to formula (4) calculated the value of stability, the maximum value of Δc_D for the instrument shows the value of stability.

$\Delta c_D =$

$c_{Di} - c_D$