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

GB/T 6167-2026

Replacing GB/T 6167-2007

Test methods for the performance of airborne particle counters

尘埃粒子计数器性能试验方法

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1. Structure and Drafting Rules of Standardization Documents". Drafting. This document replaces GB/T 6167-2007 "Test Methods for Performance of Dust Particle Counters". Compared with GB/T 6167-2007, except for the following. Aside from structural adjustments and editorial changes, the main technical changes are as follows:

a) Added terms such as dust particle counter, pulse height analyzer, particle size distribution error, pseudo-count, counting response capability, and overlap error. Difference and its definition (see 3.1, 3.4, 3.7, 3.9,

- b) The terminology for standard particles, test aerosols, particle size range, particle size resolution, counting efficiency, and upper limit of particle number concentration has been changed. Its definition (see 3.2, 3.3, 3.5, 3.6, 3.8, 3.11; 3.2, 3.9, 3.3, 3.6, 3.5, 3.4 in the.2007 edition);
- c) The terms "suspended particles," "particle size range accuracy," and "preheating time" and their definitions have been removed (see sections 3.1, 3.7, and 3.8 of the.2007 edition).
- d) Requirements and test methods for sampling time and particle size distribution error have been added (see 4.1, 4.3.3, 5.3, and 5.5.4);
- e) The requirements and test methods for spurious counts have been changed (see 4.5, 5.7, and 6.3.3 in the.2007 edition);
- f) The requirements and test methods for counting response capability have been changed (see 4.6, 5.8, and 6.3.4 in the.2007 edition);
- g) The requirements for test conditions have been changed (see 5.1, 6.1 in the.2007 edition);

4 Requirements

4.1 Sampling Time The timing error of the particle counter during continuous sampling for 5 minutes should not exceed ± 1 second.

Note. This requirement does not apply to particle counters that do not have time control functionality.

4.2 Sampling flow rate The relative error of the particle counter sampling flow rate should not exceed $\pm 5\%$.

Note. This requirement does not apply to particle counters that do not have a built-in sampling pump.

4.3 Particle size parameters

4.3.1 Particle size setting error The particle size setting error of the particle counter should not exceed $\pm 10\%$.

4.3.2 Particle size resolution The particle size resolution of the particle counter should not exceed 15%.

4.3.3 Particle size distribution error When using 0.4 μm standard particles, the particle size distribution error of the particle counter should not exceed 15%; when using 0.6 μm standard particles... At that time, the particle size distribution error of the particle counter should not exceed -30%.

4.4 Counting efficiency When using standard particles at the corresponding minimum particle size setting, the counting efficiency of the particle counter should be $(50 \pm 20)\%$; when using the corresponding When using standard particles at

1.5 to 2 times the minimum particle size setting, the counting efficiency of the particle counter should be $(100 \pm 10)\%$.

4.5 Pseudo-counting The particle counter continuously samples air samples that do not contain particles within the instrument's measurement range, considering the upper limit of the 95% confidence probability of the Poisson distribution. The value should not exceed 1 grain/5 min.

4.6 Counting Response Capability When switching from sampling high-particle-number-concentration gas to clean gas, the counting response capability of the particle counter should not exceed 0.5%.

4.7 Upper limit of particle number concentration The upper limit of particle number concentration of a particle counter should not be lower than 90% of the nominal value.

5.2 Test Materials and Instruments

5.2.1 The test materials shall conform to the requirements of Table 2.

5.2.2 The testing instruments shall comply with the following provisions.

- a) Electronic stopwatch. 0.01s graduation value, maximum permissible error of $\pm 0.1\text{s}$ per hour.
- b) Gas flow meter. The range covers the sampling flow rate of the test particle counter, with a maximum permissible error of $\pm 2\%$.
- c) Pulse height analyzer. sampling frequency not less than 10MHz, indicated voltage range covering 0V~10V, maximum permissible indicated voltage Error $\pm 0.2\%$, sampling channels no less than 256.
- d) Reference particle counter. Compared with condensation nucleus particle counters or higher-performance instruments, the counting efficiency meets the requirements of 4.4; When used for particle number concentration upper limit tests, the particle number concentration upper limit shall not be lower than the particle number concentration of the test particle counter.

1.5 times the limit.

e) Reference condensed nucleus particle counter. the counting efficiency is calibrated and does not exceed $(100 \pm 10)\%$.

5.3 Sampling Time

5.3.1 Power on and warm up. After the particle counter enters normal working condition, set the sampling time to 5 minutes.

5.3.2 Simultaneously start the electronic stopwatch and particle counter. When the particle counter reaches the set sampling time, stop timing and record the stopwatch's lowest value. The time (t) is then displayed.

5.3.3 The sampling time error is calculated according to formula (1).

5.4 Sampling flow rate

5.4.1 Connect the gas flow meter to the sampling inlet of the particle counter. The length of the connecting pipe should not exceed 0.3m.

5.4.2 After powering on and preheating, once the particle counter is in normal working condition, begin sampling and read three flow measurement values, taking the average value. The first set of flow measurement results was used to run the system for

0.5 hours. Afterward, the flow was measured three more times using the same method, and the average value was taken as the second set of flow measurement results. The relative deviation between the two sets of measurement results should not exceed $\pm 5\%$.

5.4.3 The relative error of the sampling flow rate is calculated according to formula (2).

5.5.1 Voltage Setting

5.5.1.1 A relationship between the electrical pulse height and particle size should be established using standard particles to determine the response of each particle size setting on the particle counter. The voltage should be considered; when the particle counter introduces different amplification factors for different particle size settings in the circuit analysis system, it should be processed in segments.

5.5.1.2 Select standard particles corresponding to each particle size setting of the particle counter. Prepare dilution solutions according to the requirements of Appendix B, and follow the procedures outlined in Appendix C. The specified test apparatus shall generate monodisperse aerosols, and the particle number concentration shall not exceed the upper limit of the particle number concentration of the particle counter. 25%.

5.5.1.3 After powering on and preheating, once the particle counter is in normal working condition, connect its sampling inlet to the sampling tube of the test device and input the pulse... The height analyzer is connected to the pulse signal output of the particle counter.