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

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**Aerosol particle number concentration - Calibration of
condensation particle counters**

气溶胶颗粒数量浓度 凝结核颗粒计数器的校准

(English Translation)

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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 is equivalent to ISO 27891:2015 "Calibration of aerosol particle number concentration condensation particle counters".

This document has made the following minimal editorial changes.

---Replace "ISO/IEC 17025" with "GB/T 27025 or ISO/IEC 17025".

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Introduction

A condensation particle counter (CPC) is a device that measures the number concentration of tiny aerosol particles. Generality of all different types of CPC the principle is. ultrafine and nanoparticles condense and grow through supersaturated vapor to form droplets that can be detected by optical methods. The droplets pass through the detection method.

When measuring the area, it is illuminated by a focused beam and detected with a photodetector, and finally the droplets are counted using the light scattering method. These counts combined from a known volume of sample gas, the particle number concentration can be obtained. At low concentrations, CPC can detect individual particles and obtain the absolute number of particles.

concentration.

CPCs on the market use different working fluids to generate vapor, such as n-butanol, isopropyl alcohol or water. In addition, different principles are used in applications to achieve the required supersaturation of the sample gas. The most common CPC uses the principle of laminar flow diffusion heat transfer. The diffusion constant of the working fluid determines the required Whether to heat or cool to start condensation is also the design principle of laminar flow CPC. Turbulent flow CPC is less common, and its working fluid and clean the air first reaches saturation, and then turbulently mixes with the sample gas to reach supersaturation. Figure 1 shows one of the most common implementations by heating the saturator and condenser Schematic diagram of laminar flow CPC type.

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1---Aerosol inlet; 4---Nanoparticles; 7---Liquid droplets; 10---Optical receiver;

2---working fluid reservoir; 5---thermoelectric cooling and heating device; 8---light source; 11---photoelectric detector;

3---Heating saturation chamber; 6---Condensation chamber; 9---Optical illuminator; 12---Aerosol outlet.

Figure 1 Principle of laminar flow CPC

The measurement accuracy of CPC depends on several influences. For example, an error in flow rate will cause an error in concentration. Other possible error sources include these include. overlay errors at very high concentrations, insufficient activation of very small particles, and loss of particles from the inlet to the detection area. Refined for accurate measurement, the CPC needs to be calibrated.

"Calibration" of CPC typically uses a Faraday Cup Aerosol Electrometer (FCAE) as a reference tool [33][36]. in many cases Below, the purpose of "calibration" is to determine the detection limit for small size particles. Because the detection efficiency of FCAE is