

What is the difference between optical particle counters (OPC, ISO 21501-4) and optical aerosol spectrometers (OAS, ISO 21501-1, VDI 3867-4)?

Even the names indicate the essential difference.

A) Particle counters count the particles in an aerosol.

B) Aerosol spectrometers analyse the particle size spectrum and count the particles in an aerosol.

On A) Classification of particle counters:

1. Nanoscale particles can be reliably counted using condensation particle counters (CPCs). They do not deliver any size information.
ISO 27891; VDI 3867-2
2. Clean rooms can be reliably qualified and monitored using optical particle counters (OPCs). Only in very low concentrations down to 35 particles/cm³ or 35 · 10⁶ particles/m³ can they measure "without" coincidence errors. They are therefore not suitable for determining outdoor air concentration, which is why they are not described in VDI 3867. Optical particle counters should not determine the precise particle size distribution in clean rooms, but the low concentration in a short time in a few size classes. They usually have a very high volume flow, e.g. 28.3 l/min to 50 l/min.
As there are several manufacturers, the minimum requirements are described in ISO 21501-4.

On B) Classification of aerosol spectrometers:

1. Flight time spectrometers (aerodynamic measurement method)
 $d_{ae} = 0.5 - 20 \mu\text{m}$, $C_{Nmax} = 6 \cdot 10^3 \text{ particles/cm}^3$ at $d_{ac} = 0.5 \mu\text{m}$
 $C_{Nmax} = 10^3 \text{ particles/cm}^3$ at $d_{ae} = 10 \mu\text{m}$
 C_{Nmax} is even lower for $d_{ae} = 20 \mu\text{m}$
 Droplets in the upper measurement range do not keep a spherical shape due to their acceleration.
 [VDI 3867-5]
2. Optical aerosol spectrometers (OASs)
 In contrast to OPCs, OASs measure at high concentrations. Various Palas® aerosol spectrometers can reliably determine particles in concentrations up to 10⁶ particles/cm³ or 10¹² particles/m³.
 Essentially, OASs differ in their optical design, the light source, the optical measurement volume, the quality of their components and their operation.
 Typical applications: filter testing, outdoor air measurement, indoor measurements etc.
 As there are several manufacturers, the minimum requirements are described in ISO 21 501-1 and in VDI 3867-4.

Note:

On the Palas® aerosol spectrometers base the Palas® fine dust monitoring systems Fidas® 200 and Fidas® 200 S which currently are the world's only optical measurement systems with single particle analysis of PM₁₀ and PM_{2.5} fine dust fractions that have passed this test in accordance with DIN EN 12341 and DIN EN 14907 and have been certified in accordance with DIN EN 15267-1 & -2.