

# *Application Note*

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## *How to Select a Particle Counter for my Cleanroom*

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# How to Select a Particle Counter for my Cleanroom

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Often, the selection of a particle counter for use in a cleanroom is done based upon the specifications of the instrument and the purchase price.

Before getting into the details of the specifications, it is important to look at how the instrument will be used, the environments in which it will be used and who will be using the instrument. Without this information taken into consideration, a less than optimal choice of particle counter for the application could be made.

- In what type of environment will the particle counter be used? Will it be used in an ISO Class 3 Cleanroom for routine particle counting or will it be used for verifying that a flow bench is operating prior to a critical process?
- What type of data is the particle counter expected to collect? Will this information be recorded as simple pass/fail data or will the information have to be logged into a spreadsheet or database?
- Will the operator be carrying the particle counter around and placing it on a critical work surface or will the instrument be cart mounted?
- Will this particle counter be used to certify cleanrooms and travel from location to location?
- Will the particle counter be used to monitor the cleanroom on a continuous basis? Is the particle counter intended to interface with a Facility Monitoring System (FMS)?



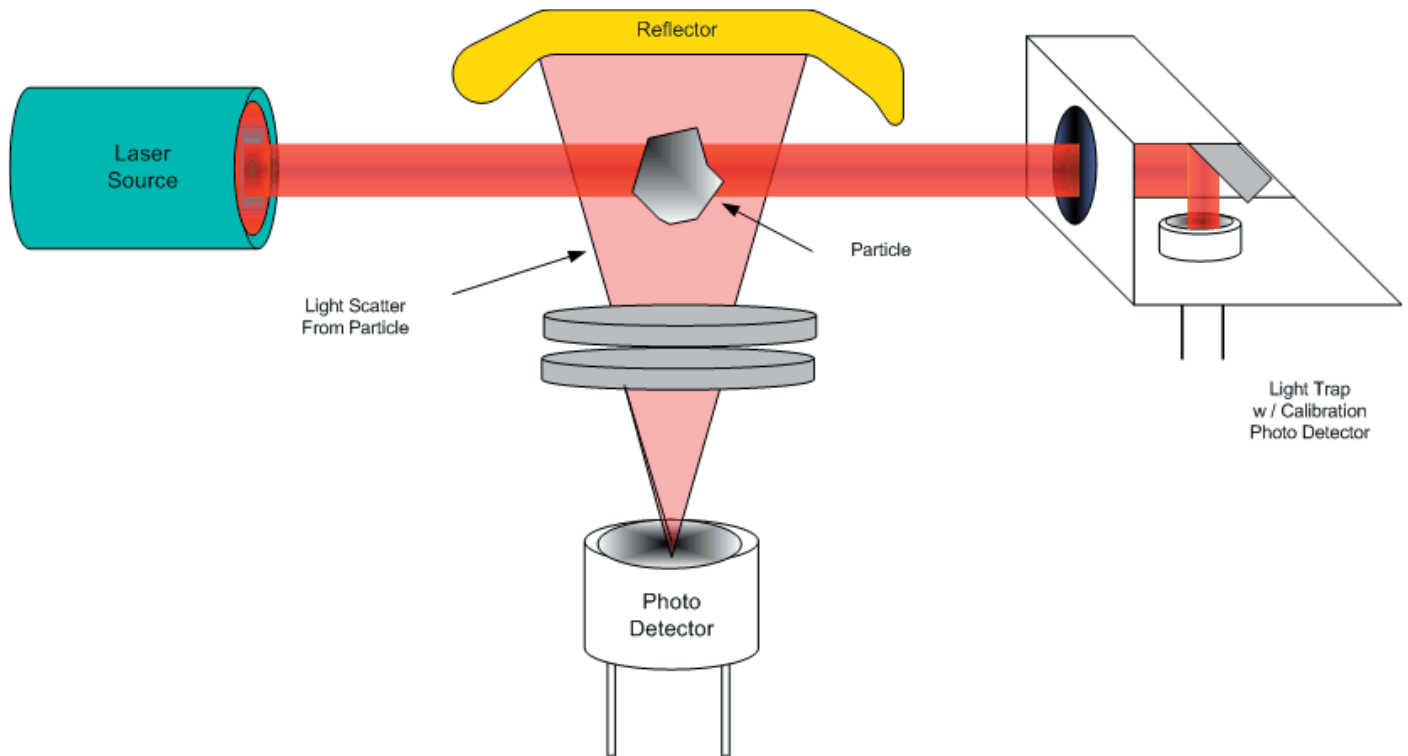
## How does a particle counter work?

An aerosol particle counter works on the principal of either light scattering or light blocking. An aerosol stream is drawn through a chamber with a light source (either Laser Based Light or White Light). When a particle is illuminated by this light beam, the light is redirected or absorbed. Light scattered by a single particle in a specific direction in relation to the original direction has a unique signature which relates to the size of the particle. This allows for sizing and counting of individual particles.

A particle counter is made up of 4 components:

- 1) Light source (Gas Based Laser, Solid State Laser Diode, High Intensity Light)
- 2) Photo Detection Electronics
- 3) Sample Flow System
- 4) Counting Electronics

Some of these components may be located entirely within the particle counter or located remotely. The light is collimated to illuminate the sample volume. As particles pass through this volume, they scatter light. The photo detection system measures the amount of light scattered. The sizes of the particles are determined by the intensity of the scattered light.



## Specifications

Although all manufacturers use the same design principles, the details of the design are what differentiates one manufacturer from the rest. Specifications like sample flow rate, sensitivity, size range, number of counting channels, durability of the laser or laser diode, lifetime of the light source, the ability to hold calibration are all important factors to consider when choosing a particle counter.

**Sensitivity:** the smallest size particle that can be detected.

**Zero Count Level or False Count Rate:** the number of falsely reported particles using filtered air at the optimum flow rate for a given amount of time. The standard reporting of this count is the number of particles per 5 minute interval. A normally expected Zero Count rate is less than 1 count per 5 minutes.

**Counting Efficiency:** the ratio of the measured particle concentration to the true particle concentration. The true particle concentration is measured with a more sensitive instrument that has a counting efficiency of 100% at the minimum particle size of the instrument under test. A properly designed instrument should have a 50% counting efficiency on its smallest range.

**Channels:** the number of “bins” in which the particles are placed, based upon the respective size of each particle counted. Channels are represented in microns. For example, you may have a particle counter with 4 channels. This means that the particles can be counted and binned in 4 different channels. For example, a 4-channel counter might include the following channel sizes: 0.3  $\mu\text{m}$ , 0.5  $\mu\text{m}$ , 1.0  $\mu\text{m}$ , 5.0  $\mu\text{m}$ .

**Flow Rate:** the amount of air that passes through the particle counter. This is typically represented in cubic feet per minute. Common flow rates are 1.0cfm and 0.1cfm. The greater the flow rate, the larger the pump to pull the air and this usually translates into a bigger particle counter.

All too often, minimum channel size is chosen over the other criteria. Although this is an important consideration, other parameters should also be considered.

Typically, the more sensitive the instrument, the higher the initial investment and the higher the maintenance cost. If the instrument is used in environments with extremely high concentrations of particles, it may require frequent cleanings by service technicians.

By understanding the intended use of the particle counter and the specifications, the customer can make a more educated decision when selecting an instrument.

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