

# Basics of Particle Counting, Part 1

by Jason Kelly

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Particle Counters have been around for many years and are used in many Industries and they are an important tool for early fault diagnosis of a Cleanrooms air filtration integrity. In this guide we will focus on the basics of Particle Counter's and go over the basics of the technology and how particle counters should be handled and maintained.

### First time use

At Lighthouse our goal is to make your experience using our particle counters as simple as possible. Our new Apex Z range is the latest feature packed particle counter on the market with the latest technology and innovation. In general for any model particle counter it is important to understand how to use the instrument correctly. This guide can be used as a reference for any particle counter as it has been designed to enable particle counter users to understand the basics of particle counters and their use an importance in today's cleanrooms.

### Zero Count Filter & Zero Counting

What is a Zero Count filter? In terms of particle counting it is your best friend. A zero count filter is a filter that attaches onto the sample inlet of the particle counter and enables the user to determine that the sensor is clean. Sometimes referred to as a purge filter the filter when attached and when the particle counter is operational and taking samples should clean up the sensor. The expectation when using a zero filter is to see 0 counts across all particle channels.

You may get a few counts in some channels but in general the expectation is to see zero counts. Your SOP should include the use of the zero count filter. For example it should be used before the unit is used to take samples. It verifies the sensor is clean and eliminates false positives. It should be used when transporting the particle counter between rooms to prevent cross contamination.

It is also a great troubleshooting tool and can also validate sample tubing to verify the tubing is particle free and eliminate false positives.

If you have any doubts surrounding your particle counters sensor and the particle counts you are getting seems higher than what you are expecting then place the filter onto the sensor and wait for the sensor to clean up.

Don't forget to take it off before you sample your process or environment





## Getting Started – Cleanroom Certification

Portable Particle Counters like the Apex Z have been designed specifically for Cleanroom Certification. In fact the Apex Z has advanced features to help you Certify your cleanroom with ease. ISO14644-1 2015 is the latest revision for Cleanroom Certification. This international standard is probably one of the most used and recognized cleanroom standard. To summarize the standard a volume of air is sampled based on the Cleanroom Classification and number of samples to be taken (derived from the area of the room using a reference table). The average counts of the sizes of particles of interest must agree with the ISO 14644-1 table.

Table 1 — ISO Classes of air cleanliness by particle concentration

ISO Class number (N)	Maximum allowable concentrations (particles/m <sup>3</sup> ) for particles equal to and greater than the considered sizes, shown below <sup>a</sup>					
	0.1 μm	0.2 μm	0.3 μm	0.5 μm	1 μm	5 μm
1	10 <sup>b</sup>	d	d	d	d	e
2	100	24 <sup>b</sup>	10 <sup>b</sup>	d	d	e
3	1 000	237	102	35 <sup>b</sup>	d	e
4	10 000	2 370	1 020	352	83 <sup>b</sup>	e
5	100 000	23 700	10 200	3 520	832	d, e, f
6	1 000 000	237 000	102 000	35 200	8 320	293
7	c	c	c	352 000	83 200	2 930
8	c	c	c	3 520 000	832 000	29 300
9g	c	c	c	35 200 000	8 320 000	293 000

<sup>a</sup> All concentrations in the table are cumulative, e.g. for ISO Class 5, the 10 200 particles shown at 0,3 μm include all particles equal to and greater than this size.  
<sup>b</sup> These concentrations will lead to large air sample volumes for classification. Sequential sampling procedure may be applied; see Annex D.  
<sup>c</sup> Concentration limits are not applicable in this region of the table due to very high particle concentration.  
<sup>d</sup> Sampling and statistical limitations for particles in low concentrations make classification inappropriate.  
<sup>e</sup> Sample collection limitations for both particles in low concentrations and sizes greater than 1 μm make classification at this particle size inappropriate, due to potential particle losses in the sampling system.  
<sup>f</sup> In order to specify this particle size in association with ISO Class 5, the macroparticle descriptor M may be adapted and used in conjunction with at least one other particle size. (See C.7.)  
<sup>g</sup> This class is only applicable for the in-operation state.

For example if your room classification is ISO 5 then you must not exceed more than 3520 particles at a size of ≥0.5μm for a sample volume of 1m<sup>3</sup>. Therefore the location sampled must have less than 3520 particles ≥0.5μm to consider the room to pass for that size range. The GRID VIEW on the Apex Z makes it much easier for the user to see what locations have been sampled and if that location agrees with ISO 14644-1 or not.

This innovative way to review the sampled data in real time enables the user to work their way through each room and mitigate from any operator errors which could result in the work having to be redone. This feature reduces risk and guarantees conformance.

This new concept truly enhances your environmental monitoring program with pre-set sample plans controlled by user access security and implemented as part of a company’s quality system.

