Guide to Selecting a Particle Counter for Cleanroom Certification

KANOMAX
The Ultimate Measurements

Application Note

This guide will use the ISO 14644: 1999 standards as a guide to help customers select an appropriate particle counter for use in certifying or spot-checking their cleanroom. This is a basic guide designed to help businesses or customers who need guidance in choosing the correct particle counter for their application.

At the bottom of the page is a copy of the ISO standard indicating the classes of cleanrooms and acceptable particle levels for each.

There are two main factors that influence the choice of a particle counter:

The first is the particle size(s) that are to be monitored. This is partially determined by the ISO class of the particular cleanroom, but also depends on the customer's needs. Typically a customer will chose one or two particles for the certification test (if you need help choosing which particle sizes to monitor please refer to the ISO standard). When purchasing your particle counter you will need to check the specifications to ensure the instrument can measure particles of the appropriate size(s).

50LPM Portable Particle Counter Model 3910

Kanomax particle counters have the following particle size ranges:

Particle Counter Model #	Particle Size Range
3888 Handheld	0.3 / 0.5 / 5.0 µm
3889 Handheld	0.3 / 0.5 / 1.0 / 3.0 / 5.0 / 10.0 µm
3905 Portable	0.3 / 0.5 / 1.0 / 3.0 / 5.0 / 10.0 µm
3910 Portable	0.3 / 0.5 / 1.0 / 3.0 / 5.0 / 10.0 µm

ISO Cleanroom Classification Table

	ISO classification	Highest levels of particle concentrations (particles/m^3) equal to or greater than the parameters listed as follows.					
		0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	5.0 µm
Certify every 6 months	Iso Class 1	10	2	-	-	-	-
	Iso Class 2	100	24	10	4	-	-
	Iso Class 3	1,000	237	102	35	8	-
	Iso Class 4	10,000	2,370	1,020	352	83	-
	Iso Class 5	100,000	23,700	10,200	3,520	832	29
Certify every 12 months	Iso Class 6	1,000,000	237,000	102,000	35,200	8,320	293
	Iso Class 7	-	-	-	352,000	83,200	2,930
	Iso Class 8	-	-	-	3,520,000	832,000	29,300
	Iso Class 9	-	-	-	35,200,000	8,320,000	293,000

Make sure you choose a particle counter that can measure all the particle sizes that need to be monitored.

The second factor that you'll want to consider is the flow rate capability of the particle counter. In order to do that we need to consider one of the formulas from the ISO standard:

Formula: Vs = (20/Cnm) x 1000

Vs = the minimum single sample volume per location, expressed in litres

Cnm = is the class limit (number of particles per cubic metre) for the largest considered particle size specified for the relevant class.

20 = the defined number of particles that could be counted the particle concentration were at the class limit.

This formula will calculate how many litres of air need to be sampled at each location in the cleanroom. Here's an example to clarify:

Let's say we're certifying an ISO class 6 cleanroom. The largest considered particle size for this class is 10.0 µm of which the cleanroom must have less than 293 particles per m^3. So if we take our formula and plug that # in it will look like this:

Vs = (20/293) x 1000

If we calculate the formula we come up with Vs = 68.3. So in order to certify this cleanroom we need to sample 68.3 litres of air at each measuring point. That means that if we choose a small handheld particle counter with a flow rate of 2 litres per minute we will have to sample the air for 34.2 minutes at each measuring point. In this case it may be more economical to use a particle counter with a faster flow rate, such as the 3910, to minimize the time spent certifying the cleanroom.

Kanomax particle counters have the following flow rates:

Particle Counter Model #	Flow Rate
3888 Handheld	0.1 CFM / 2.83 L/min
3889 Handheld	0.1 CFM / 2.83 L/min
3905 Portable	1.0 CFM / 28.3 L/min
3910 Portable	1.77 CFM / 50 L/min

In summary, handheld counters tend to be the ideal economical solution for spot-checking and certifications where high volume measurements aren't required. Larger portable units with a higher flow rate are better suited for applications where a significant volume of air needs to be sampled at each point.

Beyond these basic functions you may also want to consider additional features that come with your particle counter. For example, our models 3888, 3905 and 3910 come pre-programmed with the ISO formulas. The 3889, 3905 and 3910 have optional probes that can measure airflow, temperature and relative humidity. Features like this can be real time savers if they are relevant to your specific application.

Kanomax also offers several other instruments that can be used to perform other cleanroom tests in accordance with ISO standards. ISO 14644-3:2005(E) section B4, details checking the airflow in uni-directional and non-unidirectional air flow environments.

Handheld Particle Counter Model 3888

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