

# Guide to Selecting a Particle Counter for Cleanroom Certification



**KANOMAX**  
The Ultimate Measurements

## Application Note

This guide uses the ISO 14644: 2015 standards as a guide to help users select an appropriate particle counter for 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.

The particle sizes that need to be measured are largely dictated by the ISO classification of the cleanroom, as well as specific customer requirements. Most users typically select one or two particle sizes for the certification process. If you are unsure which particle sizes to monitor, please refer to ISO 14644:2015 for guidance.

It is essential to verify that your chosen particle counter can accurately detect the required particle sizes. Kanomax particle counters offer a variety of measurement ranges:

| Particle Counter Model # | Particle Size Range                              |
|--------------------------|--------------------------------------------------|
| 3888 Handheld            | 0.3 / 0.5 / 5.0 $\mu\text{m}$                    |
| 3889 Handheld            | 0.3 / 0.5 / 1.0 / 3.0 / 5.0 / 10.0 $\mu\text{m}$ |
| 3905 Portable            | 0.3 / 0.5 / 1.0 / 3.0 / 5.0 / 10.0 $\mu\text{m}$ |
| 3910 Portable            | 0.3 / 0.5 / 1.0 / 3.0 / 5.0 / 10.0 $\mu\text{m}$ |
| 3920 Portable            | 0.5 / 0.7 / 1.0 / 3.0 / 5.0 / 10.0 $\mu\text{m}$ |



50LPM Portable Particle Counter Model 3910

ISO Cleanroom Classification Table

|                         | ISO classification | Highest levels of particle concentrations (particles/ $\text{m}^3$ ) equal to or greater than the parameters listed as follows. |                   |                   |                   |                   |                   |
|-------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                         |                    | 0.1 $\mu\text{m}$                                                                                                               | 0.2 $\mu\text{m}$ | 0.3 $\mu\text{m}$ | 0.5 $\mu\text{m}$ | 1.0 $\mu\text{m}$ | 5.0 $\mu\text{m}$ |
| 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:

$$\text{Formula: } V_s = (20/C_{nm}) \times 1000$$

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

$C_{nm}$  = 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  $\mu\text{m}$  of which the cleanroom must have less than 293 particles per  $\text{m}^3$ . So if we take our formula and plug that # in it will look like this:

$$V_s = (20/293) \times 1000$$

If we calculate the formula we come up with  $V_s = 68.3$ . In order to certify the 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  |
| 3920 Portable            | 3.5 CFM / 100 L/min  |

In summary, handheld particle 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, 3910, and 3920 come pre-programmed with the ISO formulas. The 3889, 3905, 3910, and 3920 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 14644-3:2015(E) section B4, details checking the airflow in uni-directional and non-unidirectional air flow environments.



Handheld Particle Counter Model 3888