Measuring Real Life ISO 16890

International Standards Organization issues a new standard for filter testing and rating

ISO coarse	ISO ePM10	ISO ePM2,5	ISO ePM1
ISO coarse – filters allocated to this range capture less than 50% of PM10 particles.	**PM10** – Refers to the particle size fraction in the range from 0,3 µm up to 10 µm.	**PM2,5** – Refers to the particle size fraction in the range from 0,3 µm up to 2,5 µm.	**PM1** – Refers to the particle size fraction in the range from 0,3 µm up to 1 µm.

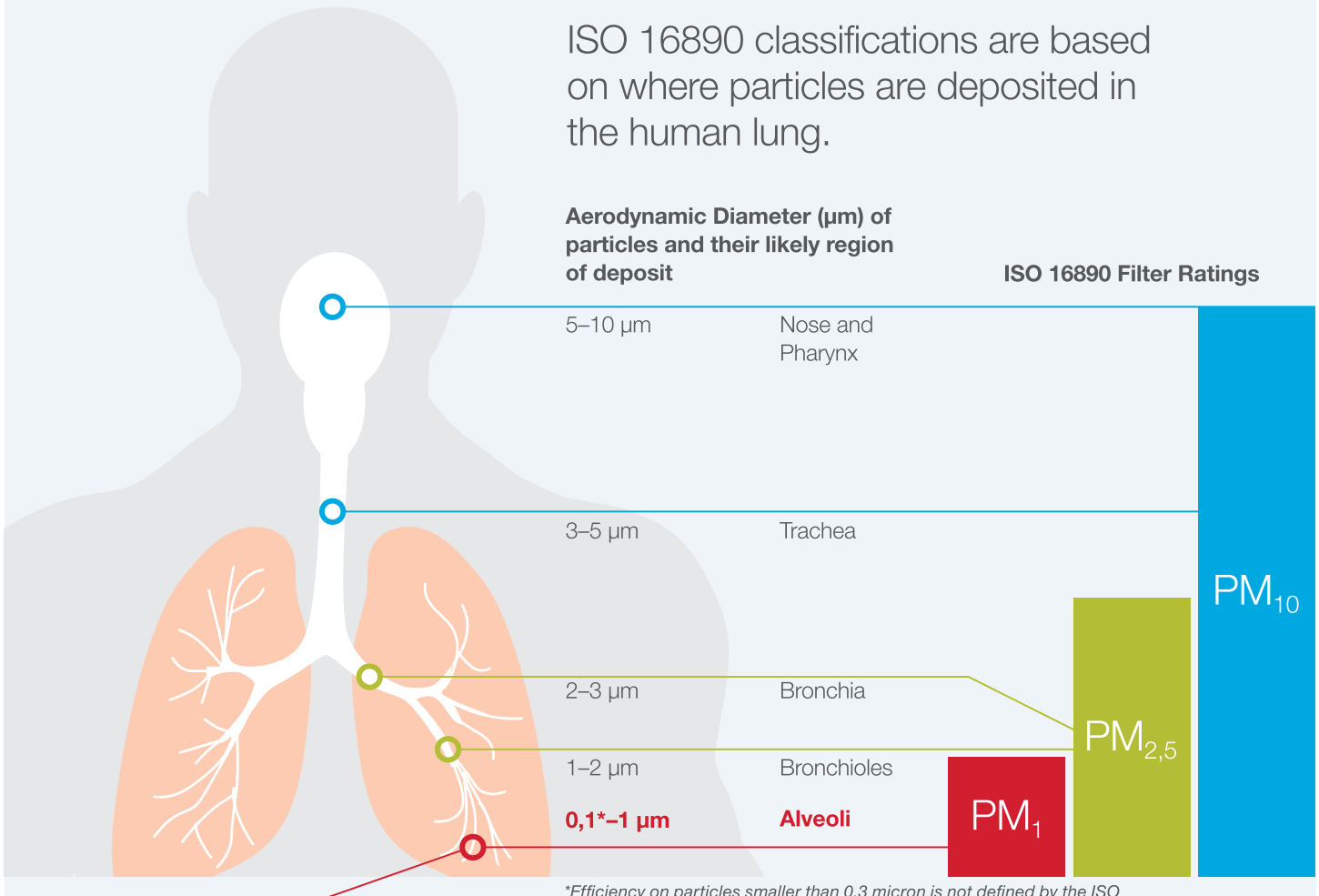
The precise definition of PM10, PM2,5 and PM1 is quite complex and not simple to measure. Public authorities, like the US EPA or the German Federal Environmental Agency (Umweltbundesamt), increasingly use in their publications the simpler denotation of PM10 as being the particle size fraction less or equal to 10 µm. Since this deviation to the above-mentioned complex "official" definition does not have a significant impact on a filter elements particle removal efficiency, the ISO 16890 documents refer to this simplified definition of PM10, PM2,5 and PM1.

More Than Logic—ISO 16890 Measures Reality!

The world's leading health-related organizations consider PM10, PM2,5 and PM1 fine dust fractions as the most important and dangerous for humans. Their official documentation to the public always refers to these PM levels.

It is more than logic that filter test methods and classifications follow this approach to demonstrate filtration performance towards the most harmful fine dusts.

ISO 16890 classifications are based on where particles are deposited in the human lung.



*Efficiency on particles smaller than 0,3 micron is not defined by the ISO

PM_1 – The Smaller the More Dangerous!

A variety of studies are focusing on the health effects of PM1 particles:

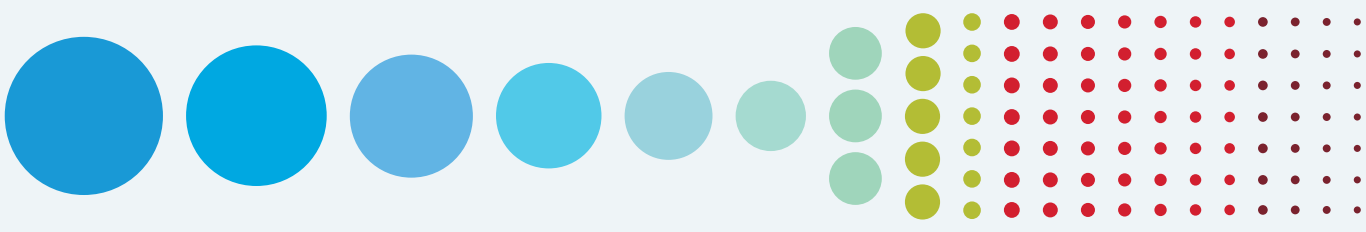
> Particles smaller or equal to 1 micron in diameter are small enough to find their way through the cell membranes of the alveoli into the human blood stream.

> Fine particles in the air measuring between 0,25 to 0,5 microns in diameter have a closer relationship to human health, especially an increased risk of cardiovascular diseases.

> Smaller particles in the body can harm the regulation of the human nervous system.

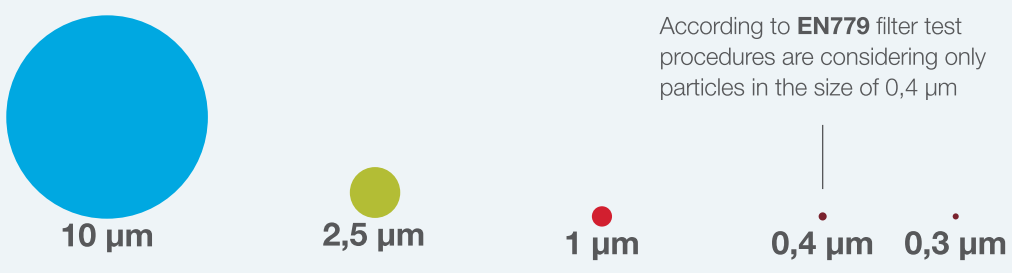
Due to their Harmfulness, Permanence, and Frequency, Particles Smaller or Equal to 1µm need the Most Attention!

The lighter and smaller a particle is, the longer it stays in the air.



Particles smaller than **1 micron** contribute only a few % to the mass, at the same time contributing to **over 90% of the numbers.**

The main difference between EN779 and the ISO 16890



According to **ISO 16890** filter test procedures are considering the range from 10 µm–0,3 µm

ISO 16890 Testing and Classification Procedure

Step 1

Filter efficiency is measured on 0,3 to 10 µm of the clean (not conditioned) filter.

Step 2

The filter is conditioned in an isopropanol vapor atmosphere to eliminate electrostatic charge.

Step 3

Filter efficiency is measured again on 0,3 to 10 µm – now of the conditioned filter.

Step 4

Actual efficiency per PM size is calculated as the average of the conditioned and the unconditioned filter.

Important:
For a certain PM classification, the filter needs to show a minimum efficiency of 50% for the unconditioned and the conditioned filter.

Step 5

Values are allocated to ISO groups.

ISO Efficiency	Size Range, µm
coarse	> 10
ePM10	0,3 ≤ x ≤ 10
ePM2,5	0,3 ≤ x ≤ 2,5
ePM1	0,3 ≤ x ≤ 1

For ISO coarse filters Initial Gravity Arrestance is measured by loading the filter with synthetic test dust. This step is voluntary for filters classified as ePM10, ePM2.5 or ePM1.

Step 6

The reporting value for the filter is the combination of the selected ISO group and the efficiency value measured for this group – always rounded down in 5% steps.

Example:

A filter shows the following average efficiency values:

Efficiency class	Value
ISO ePM_{10}	89%
ISO $ePM_{2,5}$	63%
ISO ePM_1	49%

- Minimum efficiency of 50% is achieved for ISO ePM10 and ISO ePM2,5 – but only 49% for ISO ePM1, which is not fulfilled.
- Possible ISO groups are therefore ISO ePM2,5 and ISO ePM10
- If, for example, ISO ePM2,5 group is selected, value of 63% is rounded down to 60%.

As a result, the filter is classified as:

Classification
ISO $ePM_{2,5}$ 60%

Meaning this filter is able to capture 60% of the particles smaller or equal to 2,5 micron!

ISO 16890 Timeline