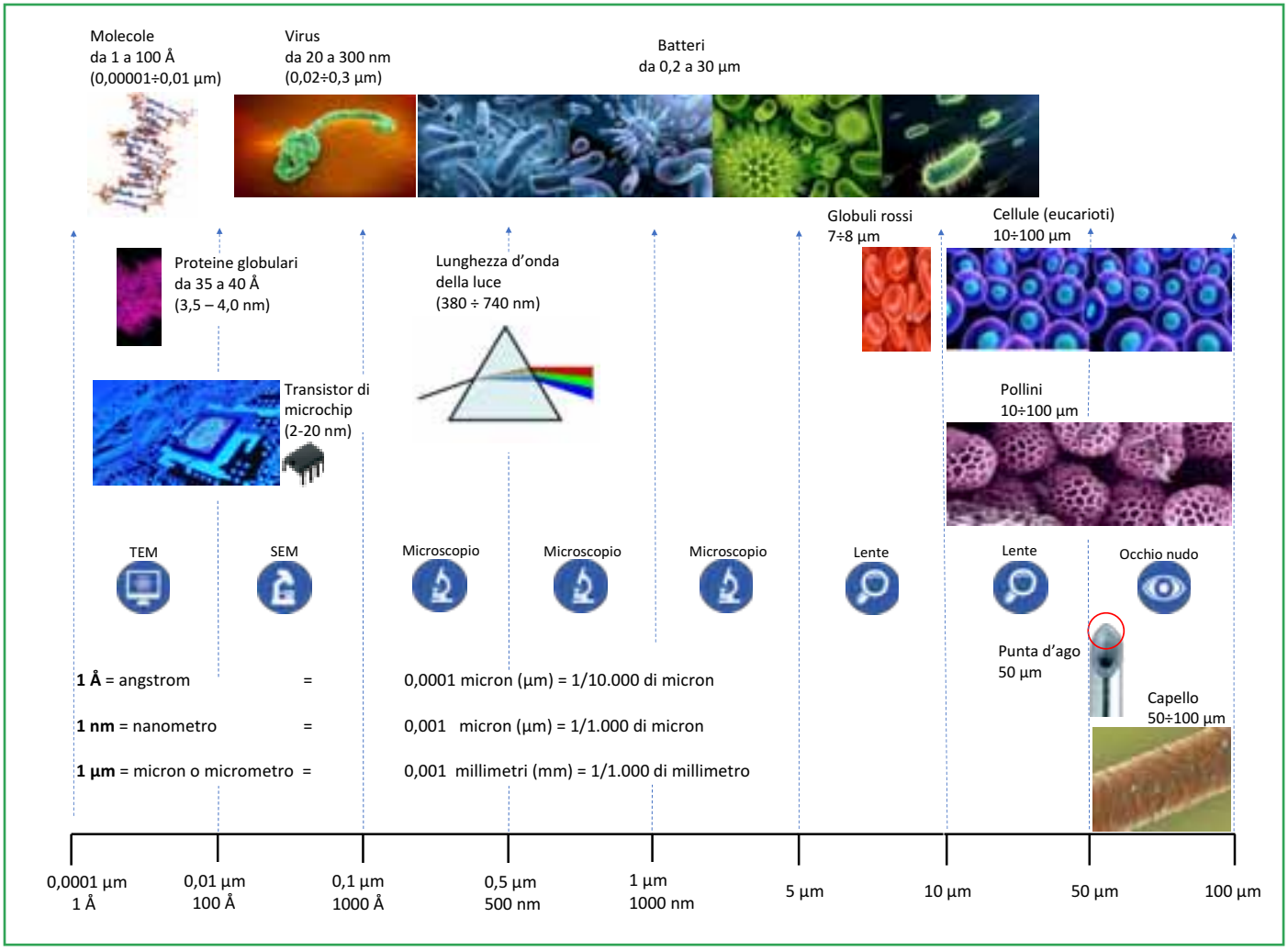
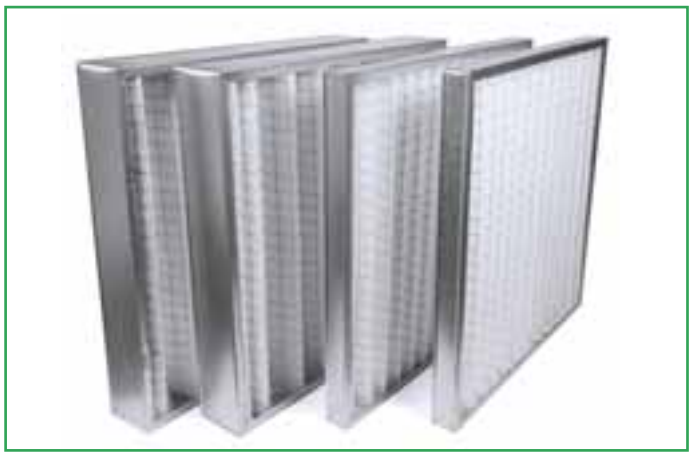
General information



General information

Air filter standards and classification
Clean rooms classification
UNI standard for operating theatres
Gas and vapors treatments
Dedusting systems

Air filters are identified in different families, depending on their use and the technical features that distinguish them.
The standards to which they respond are different and may also change depending on geographical areas worldwide.
In Europe, in the last century, at the beginning of the 1990s, started a normalization process in order to identify air filters according univocal test criteria.



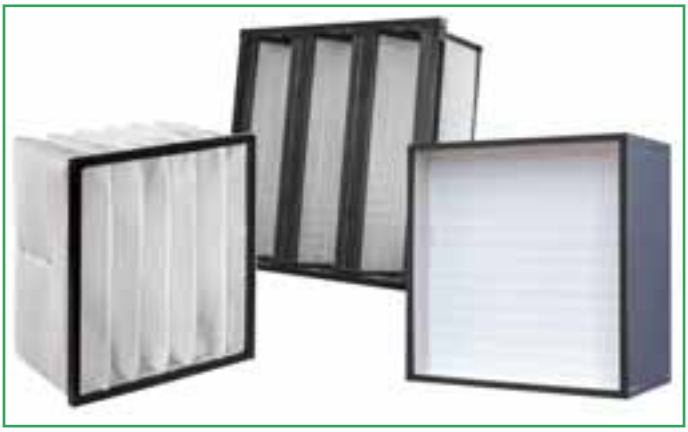
This process were completed, even though implementation and revision of the reference standards are ongoing. Air filters can be summarized according to the following families and classes:

- Primary filters or roughing filters or pre-filters. They are classified according to the standard ISO EN 16890 and generally belong to the "Coarse" filter family with an arrestance percentage indication. Previously they were classified according to EN779: 2012 (now obsolete) and identified in classes G1 to G4.

- Intermediate “Medium” filters : They are classified according to ISO EN 16890 and generally belong to the families ISO ePm10 and ePM2.5 with percentage indication of the most restrictive efficiency.

Previously they were classified according to EN779: 2012 and identified in classes M5 and M6.

-Intermediate “Fine” filters. They are classified according to the ISO EN 16890 standard and belong to the familiers ISO and PM2.5 and ISO ePM1 with percentage indication of the most restrictive efficiency. Previously they were classified according to EN779: 2012.



- Semi-absolute EPA filters. They are high efficiency filters classified according to EN1822 (or equivalent ISO 29463) and identified by the classes: E10 * - E11 - E12.
* (class not provided by ISO 29463 standard).

- Absolute HEPA filters (High Efficiency Particle Airborne). They are high efficiency filters, classified according to EN1822 (or equivalent ISO 29463) and identified by the classes: H13 and H14.

- ULPA absolute filters (Ultra Low Particle Airborne). They are highest efficiency filters, classified according to EN1822 (or equivalent ISO 29463) and identified by the classes: U15, U16 and U17.

There are also some types of filters not included within the categories described above, for which specific reference standards have been developed or based on the experience gained within the various sectors of use; belong, for example, to these types:
- Sand traps and inertial filters
- Mechanical separators such as cyclones or settling chambers
- Dust collectors using filter bags or cartridges or special media

- Washer filters (scrubbers) using liquids or mixed to catch contaminating substances
- Electrostatic precipitators that although can be included in the family of fine filters, they act with different principles from normal systems above described.

It can be substantially affirmed that this whole series of products operates a separation of the contaminant and continuously clean themselves at specific intervals of time. They differ significantly from the type of filters defined as "disposable", where it is necessary to replace the element upon reaching the recommended final pressure drop.

FILTER TRAIN

Depending on use of the filters, they can be installed in single banks or in multiple banks, in series between them.

We call this type of installation a filtering train, when the banks in series are two or more.

This type of installation is necessary in order to protect the downstream filters, generally more expensive than those that precede them, to guarantee them a greater operating life.

Filters belonging to the “Coarse” family, previously classified from G1 to G4 according to EN779: 2012 and sometimes those certified as ISO EN 16890 ePM10, are installed as first filtering stage into air handling units but also into conditioning equipment such as exchangers, humidifiers, fans etc.

"Fine" filters”, classified according to ISO EN 16890, in the groups ePM2.5 and ePM1, are final filters if installed in air conditioning systems for civil use (waiting rooms, supermarkets etc.) but are considered as second filtering stage in the case where, downstream, there is the need to use semi-absolute or absolute filters.

Filters belonging to the classes "E" or "H" are high efficiency products (High Efficiency Particulate Airborne) and are used to maintain a high level of cleanliness of the treated rooms with a constant control of the environmental pollution. Class "U" filters (Ultra Low Particulate Air borne) are very high efficiency filters, used almost exclusively in the microelectronics industry to meet the needs of ultra-clean rooms.

EN 779-2012 / Standard now obsolete, for filter belonging to families : Gross - Medium - Fine

Although this standard has been withdrawn on July 2018, it’s expected that, for a certain period of time, it will be in the minds of the users who adopted it for such a long time. It regulated the testing and classification of filters classified: "G", "M" and "F".

This kind of test was destructive for used samples and therefore the belonging to the reference classes was related to tests carried out by independent laboratories with the production that copied the certified model.

The tests of class “G” filters were carried out using a synthetic powder, with known composition, and providing for the gradual loading of the filter, until reaching the final pressure drop of 250 Pa. The test defined the average arrestance (Am%) of the filter element.

The test for classes M and F was instead carried out using a polydisperse fume as challenge called DHES, an OPC instrument (optical particle counter) and evaluating the results determined by particles having a size of 0.4 μm . In this case the test was carried out considering a final pressure drop of 450 Pa. To reduce the test time, an artificial clogging of the filtering element was created at different times, using a synthetic powder with known features.The efficiency values were measured, and through specific mathematical formulas, the value of the average efficiency was calculated . (See Tab. 1)

(1) Classification Table EN779-2012

Tipo di filtro	Classe	Arrestanza media	Efficenza media	Efficenza minima	Perdita finale
	EN779:2012	Am (%)	Em (%)0,4μ	Me (%)0,4μ	Pa
Pre-filtri	G1	50 ≤ Am < 65			250
	G2	65 ≤ Am < 80			250
	G3	80 ≤ Am < 90			250
	G4	90 ≤ Am			250

Tipo di filtro	Classe	Arrestanza media	Efficenza media	Efficenza media	Perdita finale
	EN779:2012	Am (%)	Em (%)0,4μ	Me (%)0,4μ	Pa
Filtri-medi	M5		40 ≤ Em < 60		450
	M6		60 ≤ Em < 90		450

Tipo di filtro	Classe	Arrestanza media	Efficenza media	Efficenza minima	Perdita finale
	EN779:2012	Am (%)	Em (%)0,4μ	Me (%)0,4μ	Pa
Ffiltri-fini	F7		80 ≤ Em < 90	35*	450
	F8		90 ≤ Em < 95	55*	450
	F9		95 ≤ Em	70*	450

* Me: Minimum efficiency required during all performed tests (initial, with electro static discharge, average).