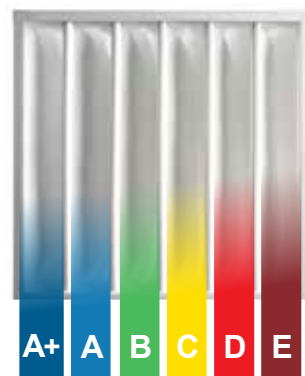




▶ **TROX energy-saving filters** ▶▶

New Eurovent energy classification
from 2019



TROX[®] TECHNIK
The art of handling air



► TROX energy-saving filters – made in Germany ►►

TROX is a global market leader in the field of ventilation systems, and uses the most advanced equipment to develop, produce and test energy-efficient filters and high efficiency filters in Germany.

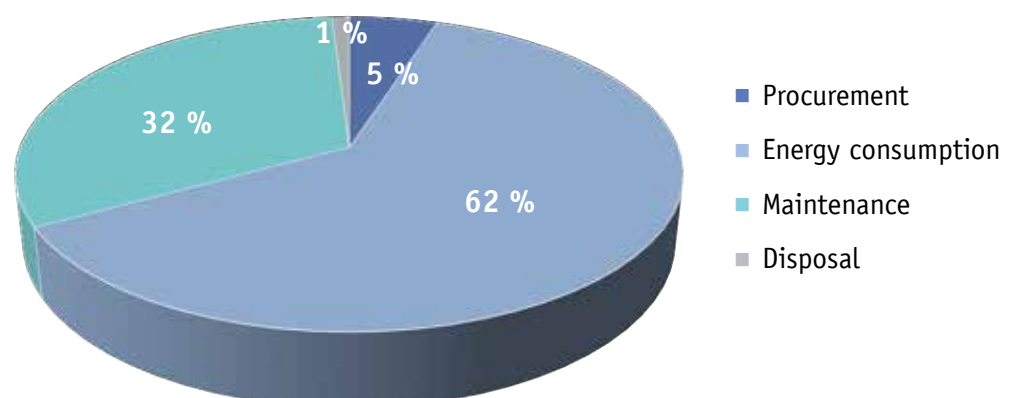
TROX aims to provide demand-based filter design for all fields of applications. All TROX fine dust filters of filter classes ePM10 > 50% to ePM1 > 90% are Eurovent certified.

In-house manufacture and development in Germany furthermore makes it possible to provide customised solutions and ensures problem-free combination with all other TROX components and systems.

TROX filters impress thanks to their high efficiencies paired with low pressure drop differential and long service life. They thus make an efficient contribution to reducing energy costs.

Energy efficiency reduces operating costs

Considered over the lifecycle of a filter, around 60% of overall costs are due to the energy consumption. Although filters themselves do not consume power, the pressure drop differential they cause in an air handling unit must be compensated through higher output of the fans.



Lifecycle costs of filters



► New energy classes in filter systems ►►

The main factors in achieving low energy costs are low pressure drop differential and long service life. Of course, this must not be done at the expense of the efficiency, because the specifications must be adhered to met.

Energy classification simplifies evaluation

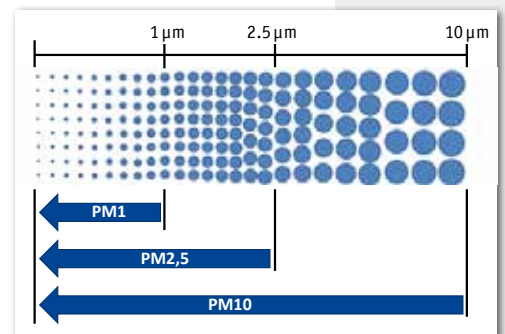
In order to be able to evaluate the energy consumption and hence the efficiency of a filter, as part of its certification programme Eurovent Certification has published an energy classification scheme for air filters, developed in collaboration with leading manufacturers of air filters.



ISO 16890 requires new energy classification scheme

With the replacement of the European filter standard EN 779 with the international standard ISO 16890, a new test procedure has been introduced for classifying efficiency, which is substantially closer to real conditions.

The new subdivision into three categories – PM10, PM2.5 and PM1 (see adjacent diagram) – made it necessary to have a new energy classification scheme to evaluate the energy consumption of a filter within its class of performance.



Particle sizes and categories





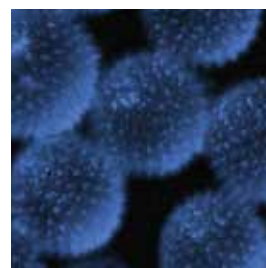
► Determining the filter class ►►



To identify the efficiency of a filter within its particle category, the PM designation has been given a suffix in the form of a percentage value in 5% increments between 50% and 95%.

For example, an air filter of the new class ePM₁₀ > 50% (formerly M5) has an efficiency of at least 50% of the PM₁₀ particles fed in, and an air filter of class ePM₁ > 80% (formerly F9) has an efficiency of at least 80% for PM₁ particles.

No dust (formerly ASHRAE dust) is used when classifying the filter class in the test according to ISO 16890. Instead, the category efficiency for different particle sizes are measured on a clean filter using two different aerosols, DEHS (0.3–1 μm) and KCl (1–10 μm).





▶ Testing the energy efficiency ▶▶

To evaluate the energy efficiency, the filter is uniformly loaded with the newly defined ISO A2 fine dust. The increase in pressure drop differential within dust feeding of the filter is measured.

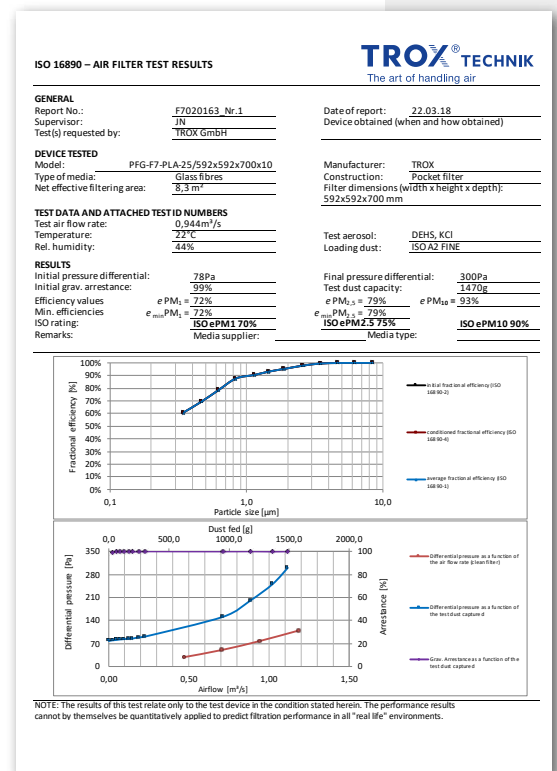
The size of the dust feed differs depending on filter class. 200 g is thus fed in for ePM1 air filters, 250 g for ePM2.5 filters and 400 g for ePM10 filters, and an evaluation is subsequently carried out.

When the final differential pressure reaches 300 Pa, the dust feed for fine dust filters (ePM1, ePM2.5, ePM10) is terminated. For coarse dust filters (ISO coarse) there is an upper differential pressure limit of 200 Pa.

Tested quality

The image shows an example of a test report for an air filter of class ePM1 > 75% (formerly F7). The pocket filter tested here accordingly has an efficiency > 75% for category PM1.

Following the test dust feed of 200 g, the pressure drop differential rose from an initial value of 78 Pa to just 85 Pa. By the time it reached the specified final pressure drop differential of 300 Pa, the air filter had achieved a massive dust storage capacity of almost 1500 g.



Test report for TROX PFG fine dust filter



TROX fine dust filter – type PFG

► The Formula ►►

for calculating the energy consumption W is as follows:

$$W = \frac{q_v \cdot \overline{\Delta p} \cdot t}{\eta \cdot 1,000}$$

q_v = air flow rate (defined = 0.944 m³/s = 3,400 m³/h)

t = operating time (defined = 6,000 h/a)

η = fan efficiency (defined = 0.5)

$\overline{\Delta p}$ = average pressure drop differential of air filter in Pa

After entering the defined values, the equation is simplified as follows;

$$W = 11.33 \times \overline{\Delta p} \text{ (kWh/a)}$$

► Calculating the energy consumption ►►

To determine the energy consumption W and classify the air filters, Eurovent adopted the previous calculation conditions with no changes. The energy consumption of an air filter is directly dependent on the average pressure drop differential during the dust feed, as before.

To simplify the comparison between energy consumptions of different air filters, Eurovent has created three stand-alone tables for classes ePM1, ePM2.5 and ePM10. Depending on the arrestance (in %) and on the annual energy consumption, the energy efficiency class is assigned from A+ to E in the respective filter class.

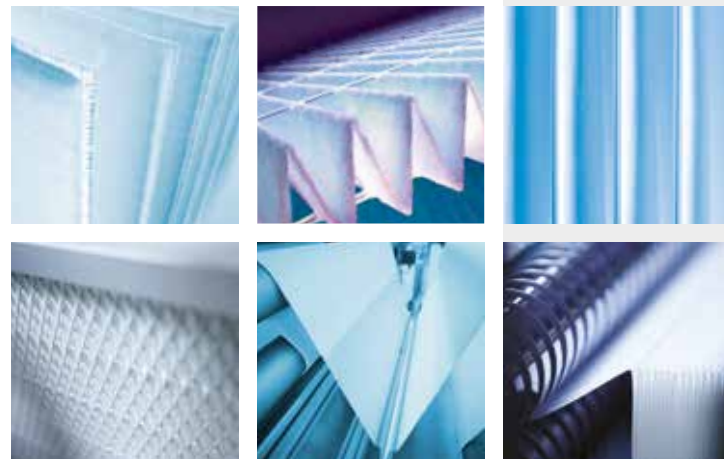
As the table shows, air filters of the worst class E consume twice as much power as those in the best class A+. So, for example, the tested fine dust filter on page 5 having an average pressure drop differential of 82 Pa has a energy consumption of (82 Pa x 11.33 =) 929 kWh/a, thus corresponding to efficiency class A+.

	AEC in kWh/a for ePM1					
	A+	A	B	C	D	E
50–55 %	800	900	1050	1400	2000	> 2000
60–65 %	850	950	1100	1450	2050	> 2050
70–75 %	950	1100	1250	1550	2150	> 2150
80–85 %	1050	1250	1450	1800	2400	> 2400
> 90 %	1200	1400	1550	1900	2500	> 2500

	AEC in kWh/a for ePM2.5					
	A+	A	B	C	D	E
50–55 %	700	800	950	1300	1900	> 1900
60–65 %	750	850	1000	1350	1950	> 1950
70–75 %	800	900	1050	1400	2000	> 2000
80–85 %	900	1000	1200	1500	2100	> 2100
> 90 %	1000	1100	1300	1600	2200	> 2200

	AEC in kWh/a for ePM10					
	A+	A	B	C	D	E
50–55 %	450	550	650	750	1100	> 1100
60–65 %	500	600	700	850	1200	> 1200
70–75 %	600	700	800	900	1300	> 1300
80–85 %	700	800	900	1000	1400	> 1400
> 90 %	800	900	1050	1400	1500	> 1500

Air filter classification by Eurovent energy efficiency class. The figures give the annual energy consumption in kWh (AEC = annual energy consumption) using the standard test and calculation conditions.




► Proven efficiency of TROX filters ►►

If, for example, you compare an air filter of category ePM1 > 50% (formerly F7) of class A+ having a energy consumption of maximum 800 kWh with a filter of class D having a energy consumption of maximum 2000 kWh, at an energy price of (just) 15 cent/kWh the energy costs are €120 per year for energy efficiency class A+ compared to €300 for class D. The difference amounts to €180 for a single filter element.

In contrast, the difference in procurement costs for an A+ filter compared to a D filter in this example is only around €40 – it is therefore less than the operating costs saved. If you consider the costs over the entire service life of a filter, the difference is considerably greater.

In addition, the low pressure drop differentials of air filters (especially of class A+ and A) have a positive effect on the energy efficiency certification of an air handling unit as set out in the Ecodesign Regulation no. 1253/2014. This is because, here, both the pressure drop differentials from the air filter and the efficiency of the heat recovery and fans are relevant to ensure that the specific energy consumption (SFP value) of the overall air handling unit remains below the maximum specification.





TROX GmbH
 Taschenfilter
 PFG-ePM1-75%-PLA-25/592x592x700x10
www.eurovent-certification.com

AIR FILTERS ISO ePM1 75%

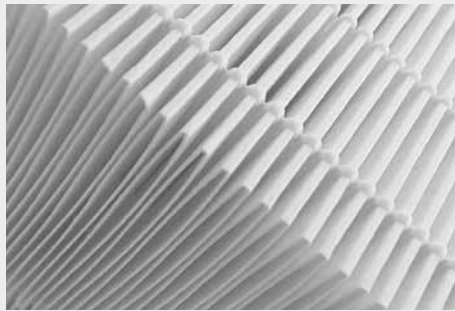
LUFTFILTER EN ISO 16890-1: 2016
 Filters pour la VENTILATION

Nominal airflow:	0.944 m ³ /s
Efficiency:	ePM1: 75 %
Minimum efficiency:	ePM1: 75 % 945 kWh/annum





THRESHOLD REFERENCE SCALE YEAR: 2019



TROX[®] TECHNIK

The art of handling air

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