MFP 4000

The MFP filter test rig is a modular filter testing system for flat filter media and small mini-filters.

This enables you to determine the pressure loss curve on the medium without a dust coating,fraction separation efficiency, orburden and fraction separation efficiency during application of the burdenand the gravimetric separation efficiencywithin shortest times – reliably and therefore cost-effectively.

The MFP 4000 operates in suction mode. This ensures a particularly uniform formation of the dust cake even at high inflow speeds.

With the FTControl test rig software of the MFP 4000, the aerosol spectrometer Promo® 1000/2000 is used for clear and reliable determination of the aerosol concentration and particle size and therefore clear determination of the fraction separation efficiency.

Operation principle

MFP 4000 with two Promo® aerosol spectrometers

1. Variable aerosol generation Thanks to the use of different dispersers for dusts, KCl/NaCl, DEHS etc.; shortened measurement times are possible e.g. through increased dust concentration

2. Corona discharge (optional): Adjustable ion stream for different mass flows. Mixed air, adjustable for inflow speeds from 0.05 to 1 m/s. Optional: Transient inflow.

3. Light scattering spectrometer Promo® 1000/2000 for clear particle measurements in high concentrations of up to 5000 mg/m^3 (SAE Fine) and low concentrations for the determination of the initial fraction separation efficiency

4. Mobile pneumatic filter holder for fast removal and loading of the test rig.

5. Gravimetric filter holder for simple and fast evaluation of the gravimetric separation efficiency.

6. Raw gas sensor

7. Clean gas sensor

Automation

The MFP 4000 has an integrated mass flow controller that it uses to control the volume flow. The volume flow rates are automatically monitored and controlled by the FTControl filter test software. The data from the integrated

sensors – such as the volume flow, temperature, relative humidity and differential pressure at the filter – are also recorded automatically during the filter test.

Measurement of the fraction separation efficiency

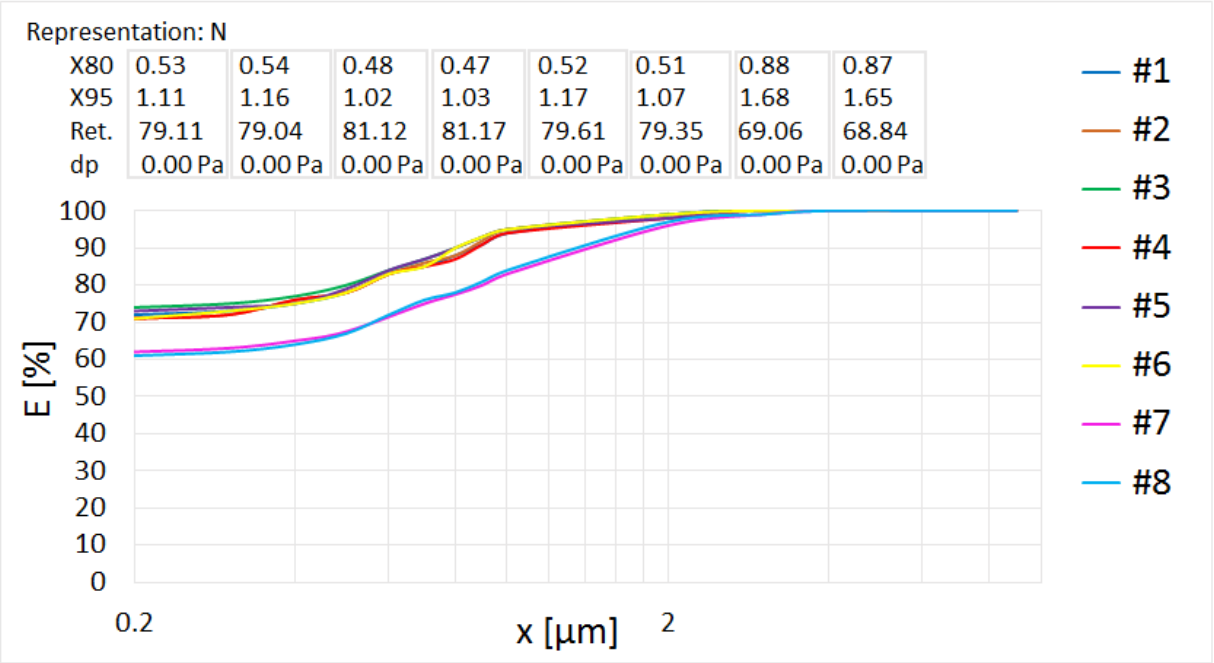

Fig. 2: Example: Comparison of fraction separation efficiencies

- Fully-automated measurement of the fraction separation efficiency
- Clear demonstration of the separation efficiency of your filter medium throughout the entire measurement range from 0.2 to 40 μm with the Promo® system
- Highest measurement reproducibility and repeatability highlight even fine differences in the separation efficiency
- Short measurement times of around 2 minutes per separation efficiency measurement thanks to optimized aerosol application
- Simple comparison of separation efficiency curves, calculation of mean values also possible

The vertical layout allows even large particles (up to 40 μm) to make their way onto the filter medium. On the raw and clean gas side, isokinetic sampling probes are provided for the raw and clean gas sensor.

Burden / hold time measurement and record of the pressure loss curve

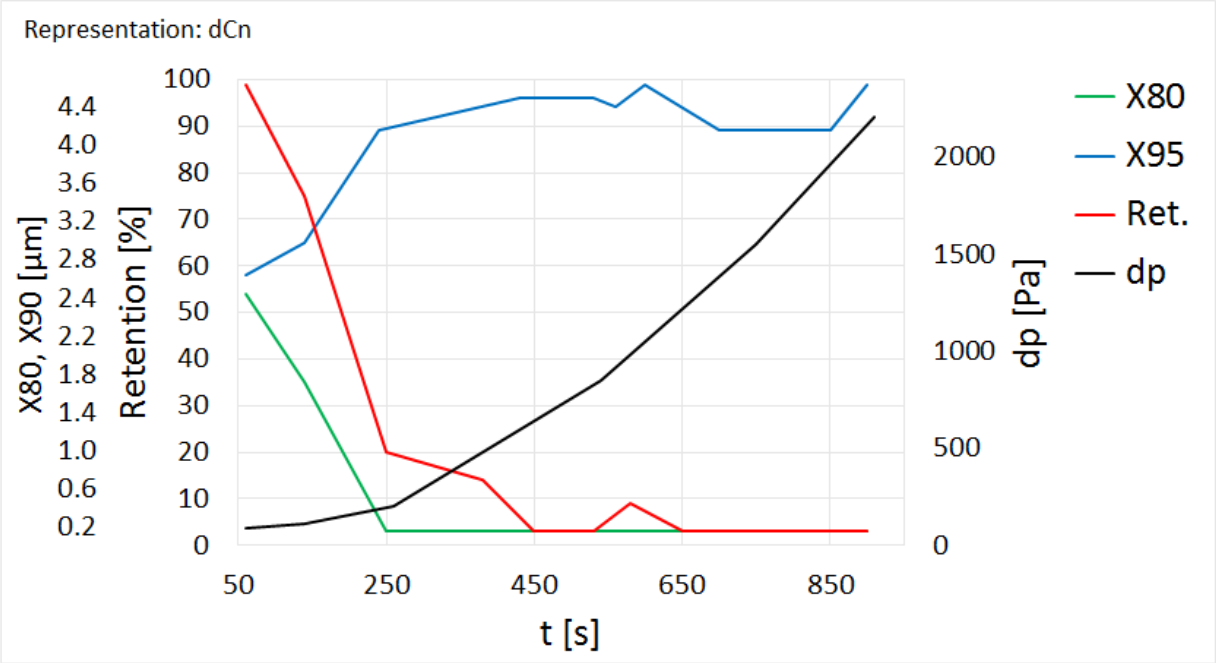

Fig. 3: Example: Hold time measurement

- Performance of measurements of the fraction separation efficiency during dust application; pressure loss or measurement time can be pre-selected as the abort criterion
- Pre-selectable burden application steps in relation to pressure loss or time
- Gravimetric determination of the separation efficiency
- Determination and representation of the pressure loss curve and retention curve in diagram and table form The representation of the particle diameters at 80% and 95% separation efficiency provides additional information.
- Comparison of the fraction separation efficiencies during the different burdening steps
- Shortening of the measurement times, e.g. through increased aerosol concentration

The use of one aerosol spectrometer Promo® 1000/2000 in raw gas and one in clean gas within simultaneous operation offers the following advantages:

- Fully-automatic simultaneous measurement of fraction separation efficiency
- Faster determination of the beginning fraction separation efficiency because of bisection of the testing time for the fraction seperation efficiency.
- Higher temporal resolution for the measurement of fraction seperation efficiency during loading.
- Using the testing system for very high and very low aerosol concentrations.

The largely automated setup of the test sequence in conjunction with the clearly defined individual components and the individually adjustable sequence programs of the filter test software FTControl combine to deliver the high reliability of our measurement results.

BENEFITS

- Simultaneous particle measurement in the raw gas and clean gas
- Particle size measurements from 0.2 – 40 μm
- Measurement of $C_{n\ max}$= 10^6 particles/cm^3 without dilution
- Internationally comparable measurement results
- High reproducibility of the testing method
- Easy use of different test aerosols, e.g. SAE Fine and Coarse, NaCl/KCl, DEHS
- Highest raw gas concentrations of up to > 1000 mg/m^3 (ISO Fine) or > 5000 mg/m^3 (ISO Coarse) with measurement of the fraction separation efficiency for burden tests
- Sequence programs for pressure loss measurements, measurements of fraction separation efficiency and burden measurements
- Easy to operate
- Short set-up times
- Cleaning and calibration can be performed by the customer
- Easy use of the measurement technology components – even in other applications
- Mobile setup, easy to move on castors
- Validation of the clear function of individual components and the overall system during pre-delivery acceptance testing and upon delivery
- Low-maintenance

NORMS AND CERTIFICATES

ISO 11155-1 / DIN 71460-1, ISO 5011, ISO 16890

DATASHEET

Aerosols	Dusts (e.g., SAE dusts), salts (e.g., NaCl, KCl), liquid aerosols (e.g., DEHS)
Test area of the medium	100 cm^2
Measurement range (size)	0.2 – 40 μm
Measurement range (mass)	Up to 1,000 mg/m³ (depending on the version)
Volume flow	1 – 35 m^3/h - suction mode
Differential pressure measurement	0 – 1,200 Pa selectable, 0 – 2,500 Pa selectable, 0 – 5,000 Pa selectable
Inflow velocity	5 cm/s – 1 m/s (others on request)
Compressed air supply	6 – 8 bar

Applications

- For filter media and small filter elements
- Product development and during production monitoring
- Testing based on ISO 11155-1 / DIN 71460-1 (cabin air filters)
- Testing based on ISO 5011 (engine pre-air filters)
- Testing based on ISO 16890 (room air filters)
- Other standards in various versions

Mehr Informationen:
https://www.palas.de/en/product/mfp4000