Automated Filter Element Test System

AFC 136

Filter test system AFC 136 for production control of filter elements (e.g. exhaust filter, HEPA filter).

For the purpose of 100% inspection of the integral filter separation efficiency during production, such as for gasoline particle filters (GPF), the filter test system AFC 136 was developed.
Production control demands for short test cycles while using robust, compact, service-reduced and safe technologies. A test cycle includes supply, analytical characterisation and removal of the test specimen. Due to its measurement concept and high degree of automatisation, AFC 136 enables reliable testing with test cycles of 30 s.
To ensure a full traceability, determined test data can be integrated directly into in-house databases by combining the filter test system with techniques for test specimen identification (e.g., bar code or QR code scanner).

Applications

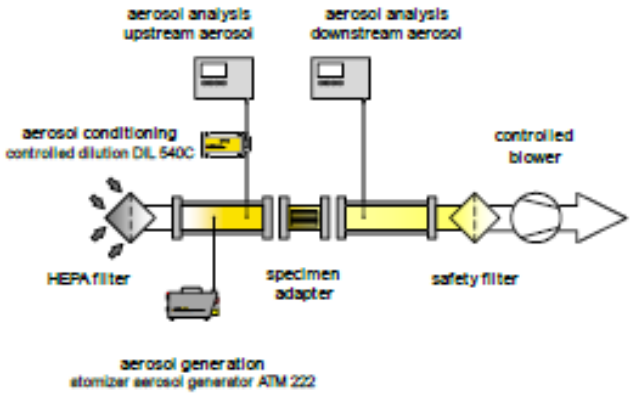
- production control of integral separation efficiency of exhaust particle filter (GPF, DPF)
- quality control of HEPA filters or filter cartridges of e.g. industrial vacuum systems
- research and development on any small air filter elements

Features

- test system designed for 24/7 operation with automated safety functions
- short test cycles (supply, analysis, removal) for separation efficiency and pressure drop
- quality criteria for separation efficiency and pressure drop are freely configurable
- minimal loading of test specimen (higher lifetime of products)

Principle of operation

The following figure shows a simplified schematic illustration of the principle of operation of the filter test system AFC 136.

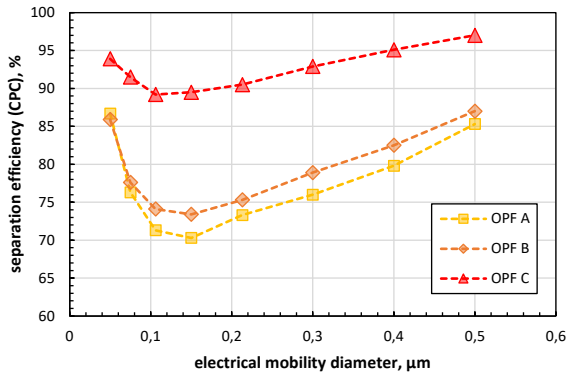


Schematic illustration of the principle of operation of the filter test system AFC 136.

A defined volumetric flow rate is sucked by a controlled blower from the environment through a HEPA inlet filter, the test duct and a safety filter. The test duct is composed of three functional sections, i.e., sections for i) the generation and characterisation of the test aerosol (upstream aerosol), ii) the incorporation of the test specimen (specimen adapter) and iii) the characterisation of the downstream aerosol.

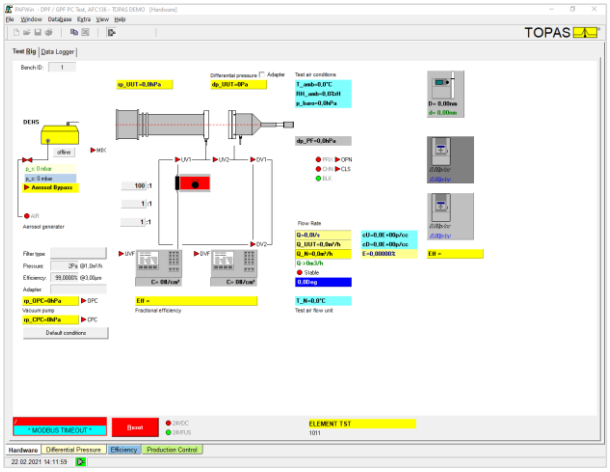
Details

Monodisperse and/or polydisperse test aerosols can be used for separation efficiency testing. Moreover, different aerosol-analytical instruments like optical particle counters (OPC) or condensation particle counters (CPC), can be implemented for the analysis of up- and downstream aerosol.



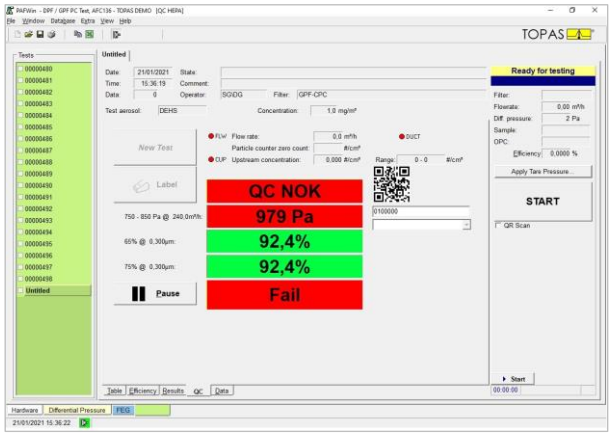
Separation efficiencies of three GPF specimen based on different monodisperse test aerosols composed of DEHS droplets, aerosol analyses by means of condensation particle counters.

The filter test system is configured for production control tasks (parameters for aerosol generation, selection and calibration of analytical instruments, specification of test criteria) via the test system software AFCWin.



Exemplary AFCWin user interface for starting up the filter test system and specifying the test conditions.

For a fast readiness of the filter test system after change of fabricated product, test procedures (as afore defined) can be saved, loaded or subsequently modified.
During the actual production control, the filter test system is operated via a touch display and an easy-structured user interface.



Easy-structured user interface for actual production control: Visualisation of test result on the basis of at least one criterion for pressure drop and/or separation efficiency.

Technical specifications

air flow rate	40 ... 440 m^3/h (customer-specific)
test aerosol supply	customer specific (monodisperse and/or polydisperse)
test aerosol substance	DEHS
analytical instruments	customer specific (e.g.: OPC, CPC, ...)
dimension of specimen	diameter ≤ 400 mm length ≤ 850 mm
test cycle duration	approx. 30 s (depending on setup)
environmental sensors	temperature, relative humidity, air pressure
power supply	3 × 400 VAC, hard-wired, rated current 30 A, pre-fuse 32 A
compressed air supply	6 ... 10 bar
dimension (w × h × d)	2,8 × 2,1 × 1,2 m
weight	approx. 800 kg