



Filter test rig AFC 131 according to VDI 3926 Part 1, version 2

Testing of Filter Media ...

is important for both the development and optimization of filter materials, as well as for quality assurance during the production process. The most interesting features for the characterization of cleanable filter media are:

- Curve of pressure drop,
- Curve of residual pressure drop,
- Fractional efficiency,
- Gravimetric separation efficiency,
- Dust penetration through the filter medium,
- Loading capacity of the filter.

Topas has developed its filter testing systems of series AFC for the determination of this standardized performance parameters. This test equipment allows testing of specific filter media for cleanable filters for dust removal from industrial flue gases and the recovery of valuable materials (bag/tube filters, cartridge filters or pocket filters) in accordance with international standards. The design of the AFC test 131 is based on the VDI 3926 Part 1, Version 2 and of the AFC 133 according to the new ISO 11057:2011. The ISO 11057 is based on the VDI 3926, ASTM D6830-02 and the JIS Z 8909-1. These test rigs can also implement a customized filter media check with individual tests and configurable work-flows. The control software runs under Windows

and was developed by Topas. It ensures easy operation of the test rig and the implementation of accurate, repeatable and traceable testing.

Special Advantages

- Possible use of various aerosols (Solid aerosols and droplet aerosols)
- Standardized testing of filters with aluminium oxide (e. g. Pural NF)
- Fully automatic test sequence over 14 hours without user intervention
- Flexible design allows for quick modifications and future expansion
- User-friendly control software PAFWin
- Excellent component matching by combining Topas devices

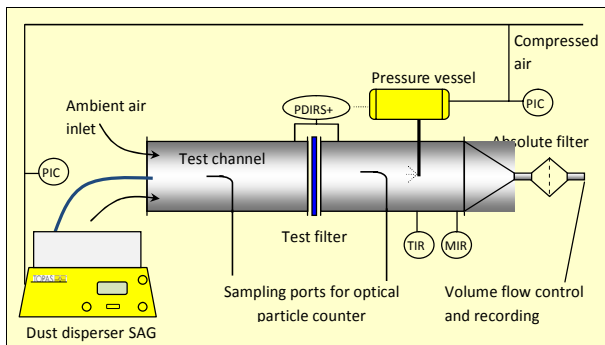
Applications

- Filter tests for cleanable filter media according to ISO 11 057 and VDI 3926
- Filter tests based on other standards
 - Air filters for air conditioning systems according to EN 779
 - Air filters for motor vehicles according to DIN 71460-1 / ISO/TS 11155-1
 - Motor intake filters according to ISO 5011
- Development and optimization of filter media according to internal company standards of the user
- Quality assurance in production

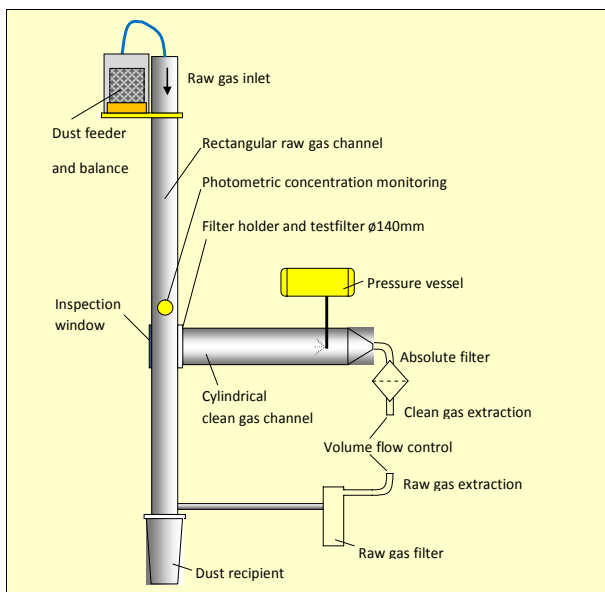


Filter test rig AFC 133 per as ISO 11057, VDI 3926 Part 1, version 1

Basic Design



Schematic of the VDI 3926-A2 filter test rig AFC 131



Schematic of the ISO 11057 filter test rig AFC 133

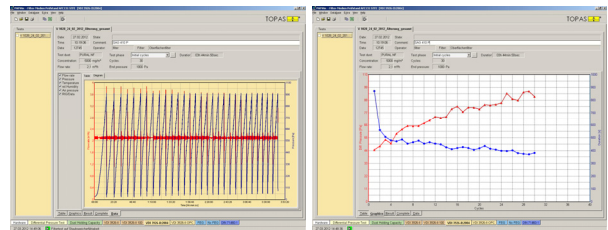
AFC test rigs consist essentially of the test channel with the test filter holder, the flow unit, the dust feeder for solid aerosol generation, the optical particle measuring device and a cleaning unit. In accordance with the normative requirements, the clean gas channel in the AFC 133 is connected horizontally to the vertical raw gas channel. In addition, the dust feed is controlled gravimetrically. Furthermore, the inlet concentration is monitored photometrically. In the area of the test filter there is a window in the raw gas channel.

Tests of Cleanable Filters

This test is conducted in accordance with VDI 3926 and ISO 11057. The continuous dust loading of the test filter leads to a steadily increasing pressure drop. When a defined pressure difference across the test filter is reached, the filter cake is cleaned periodically with a pressure pulse (pulsejet).

The pressure drop falls down to a residual pressure loss value, which is due to irreversibly stored or deposited particles. During the cleaning process the particle concentration in clean gas increases for a short time.

The cleaning unit consists of a pressure tank, a fast opening and closing solenoid valve (pressure pulse time is 50 to 200 ms) and a blowpipe with a nozzle diameter of 3 mm.



Typical test result for a cleanable filter: left side - temporal differential pressure drop, right side - the curves of the cycle times (blue) and the residual pressure drop (red)

Filter Holder

The test filter medium is clamped into a special filter holder which ensures the secure and tight fit of the filter medium during testing.

With a few simple steps, the filter holder is removed from the test channel to change the filter medium and to determine its mass. A supporting grid prevents severe deformation of the filter medium at high flow rates.

Also, the filter (absolute filter) which is downstream of the test filter medium can easily be installed and removed for weighing.

Filter Tests

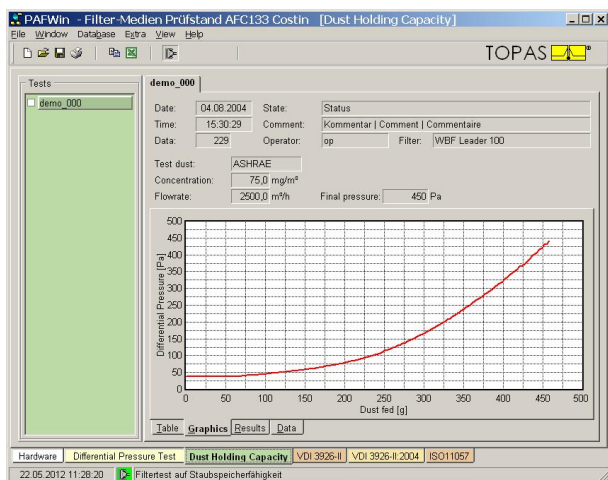
Separation Efficiency of Filters

The backup filter (absolute filter) of 40 mm free-flowed diameter downstream of the test filter is needed to determine the mass of particles in the clean gas. The test filter has a free-flowed diameter of 140 mm. By weighing these two filters (test filter and backup filter), the total separation efficiency of the medium is determined gravimetrically. For this task, scales that have at least the required accuracy of 0.01 g (test filter) and 0.01 mg (backup filter) should be used, according to the requirements mentioned in the standard.

The design of the test channel allows for easy installation and removal of the test and backup filter.

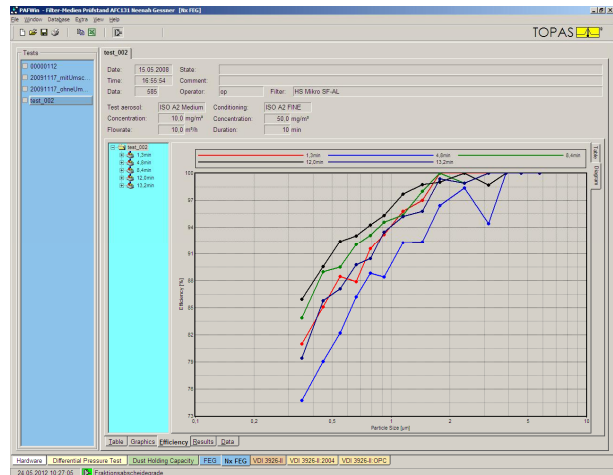
Dust Loading Tests

Dusting tests can be done on the test rigs of the series AFC as well. Here, the differential pressure increase is determined as a function of the deposited dust mass. Due to scale-up statements on the filter testing are possible, according to the test standards EN 779, DIN 71460-1, ISO/TS 11155-1 and ISO 5011.



Software window with representation of loading capacity of a dust loading test

Fractional Separation Efficiency of Filters



Software window showing fractional separation efficiencies

The fractional separation efficiency is determined using a laser aerosol spectrometer LAP 322 in a particle size range of 0.2 to 40 microns. The sampling can be controlled by switching between raw gas sampling, purge and clean gas sampling. Thus, only one single particle analyzer is required. The switching times of the controller are set freely by the user. If desired, a Topas dilution system DIL 55x or and a particle counter LAP 340 may be delivered separately.



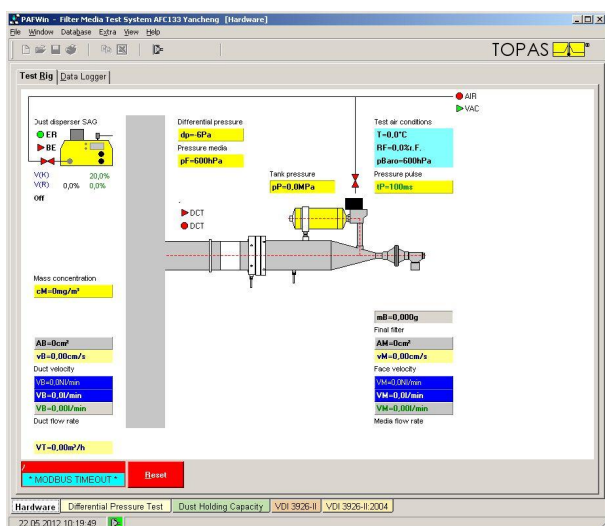
Effective measurement of particle size distributions with a laser aerosol particle size spectrometer LAP 322 (arrangement with sample switching unit below the test channel)

Control Software and Specifications

Control Software PAFWin

The control software PAFWin used for test rigs has been developed by Topas. This Windows compatible software takes over complete control of the test rig, data acquisition and data processing. The test sequence is performed automatically, but can also be controlled by the user manually. Further advantages of PAFWin are:

- Automatic test sequences according to the selected test standard
- Manual control for calibration, service and research
- Data output and data acquisition for long-term studies
- Database system for filter samples, test results and test material systems
Data presentation and statistical calculations
- Data transfer via the clipboard and Dynamic Data Exchange to Excel



PAFWin test rig AFC 133 visualization

The fractional efficiency and particle size distribution can be determined separately, stored and printed. The user is informed and guided through the test using a special instruction and display window. User-defined test procedures are available on request.

Specifications

	AFC 131	AFC 133
Volume flow rate	2 ... 40 m ³ /h	0.5 ... 5 m ³ /h
Filter cross section	176 cm ² (Ø150 mm)	154 cm ² (Ø140 mm)
Face velocity	0.05 ... 0.6 m/s	0.5 ... 5 m/min
Differential pressure	0 ... 2000 Pa	
Climate sensors	Temperature, relative humidity, air pressure	
Pressure vessel	0.2 ... 0.6 MPa	
Pressure pulse time	50 ... 200 ms	
Aerosols	Dusts: Pural NF, Pural SB, ISO 12103-2; with <i>Dust Disperser SAG 410</i> Droplets: DEHS, PAO salt aerosols, PSL with <i>Atomizer Aerosol Generator ATM 220</i>	
Aerosol Spectrometer	LAP 322, 0.2...40 µm <10 ⁴ particles/cm ³)	
Power supply	3 × 400 V AC, 16 A	
Dimensions (L x W x H)	2800 × 800 × 1500 mm	2000 × 800 × 3200 mm
Weight	ca. 120 kg	ca. 300 kg

Customized filter test rigs can be manufactured on request. The implementation of alternative devices can be arranged after consulting Topas.

QMS certified to
DIN EN ISO 9001.



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For more information please
visit our website at
www.topas-gmbh.de

Specifications are subject to
change without notice.

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