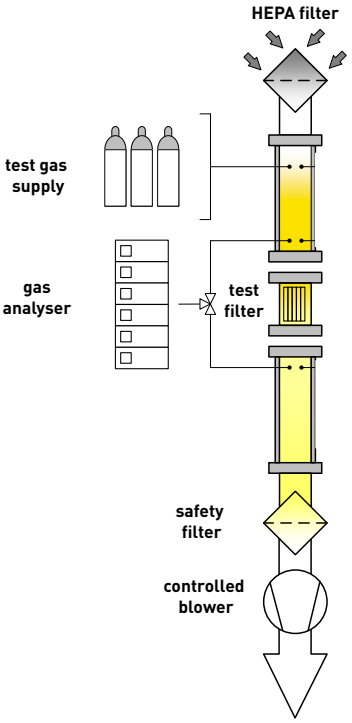
TOPAS®

Technologie-orientierte Partikel-, Analysen- und Sensortechnik

Test systems for molecular filter testing

Application overview



General scheme for molecular filter testing.

Air filters are used to separate particulate and gaseous contaminants. This application overview describes various test system solutions for the comprehensive evaluation of molecular filters used in gas separation.

Since 1995, Topas test systems have been used for quality control in manufacturing processes as well as for research and development of new filter elements and filter materials.

Applications

- differential pressure test
- determination of the adsorption efficiency
- adsorption/desorption tests
- determination of filter breakthrough curves

The molecular filter test systems listed here are primarily used to evaluate adsorptive cabin air filters, HVAC filters and intake filters for fuel cells.

According to the specific application areas of the filters tested, different requirements are placed on the test system, the test procedure and the test protocol. Additionally, there are customer-specific requirements for the test.

	intake filters	cabin air filters	general air filters
particle filtration	ISO 5011	ISO 11155-1	ISO 16890
molecular filtration	/	ISO 11155-2	ISO 10121
flow rate (m^3/h)	120 ... 1200	70 ... 700	450 ... 4500

Overview of testing filters for contaminant separation.

Application-specific requirements

- size and geometry of the filter media, bulk materials, filters or filter assemblies
- flow rate or flow velocity
- selection of test gases
- gas concentration in the test duct

Features

- gas-tight test ducts
- modular structure
- high degree of automation
- software-based test sequences
- standardised report

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PARTICLE UNDER CONTROL

Molecular filter testing

PAF 112 – Cabin air filter

All over the world, our partners successfully use the PAF 112 test system to test cabin air filters with harmful gases. It is used to quantify adsorption capacities and desorption behaviour.

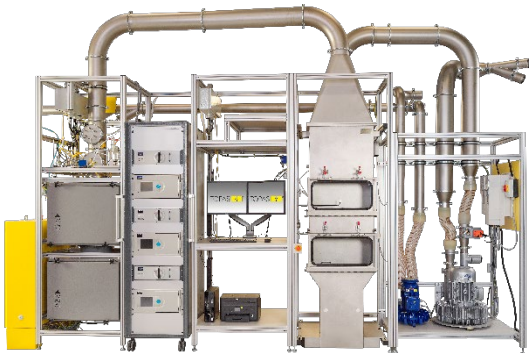
Filter elements are tested in accordance with ISO 11155-2. Further, the integration of a bypass enables testing of bulk materials and filter media.

The PAF 113 test system is a combined construction for testing with particles and gases in one test duct.

The modular design of the PAF 11X test system series makes it possible, for example, to convert a PAF 111 (testing with particulate contaminants) into a PAF 113 (testing with particulate and molecular contaminants). In addition, gas lines can be retro-fitted to all test systems.

Specifications PAF 112

- flow rate range 70 ... 700 m^3/h
- size of the filter elements: < (300 × 600) mm



PAF 112 cabin air filter test system.

FCT 113 – Fuel cell intake filter

The FCT 113 test system was designed for testing larger filter elements. Due to the larger test duct dimensions, the higher flow rates, the integrated test gas dosing and the corresponding measure-ment technology, the FCT 113 is specially designed for testing air intake filters for fuel cells.

The test gas dosing and its measurement are adapted specifically to the application. The use of an innovative bypass system also allows bulk materials and filter media to be measured at lower flow rates.

Specifications FCT 113

- flow rate range 70 ... 1 400 m^3/h
- size of the filter elements: < (500 × 700) mm

FCT 113 test system for fuel cell intake filters.

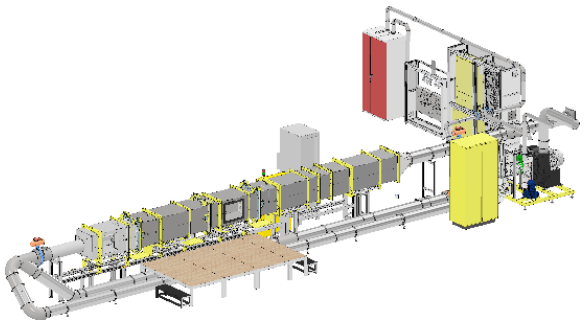
GAF 114 – HVAC molecular filter

The GAF 114 test system can be used to test pocket, cassette and cartridge filters as well as filter cartridges in accordance with ISO 10121.

The construction of GAF 114 was made for testing filter elements in accordance with ISO 10121. Likewise, the design of the bypass for the filter media and bulk materials were derived from the standard. By integrating this bypass system, the GAF 114 can fulfil a wide range of testing tasks.

Specifications GAF 114

- flow rate range 400 ... 4 500 m^3/h
- size of the filter elements: < (610 × 610) mm (variable depth)



GAF 114 test system for general air filters.

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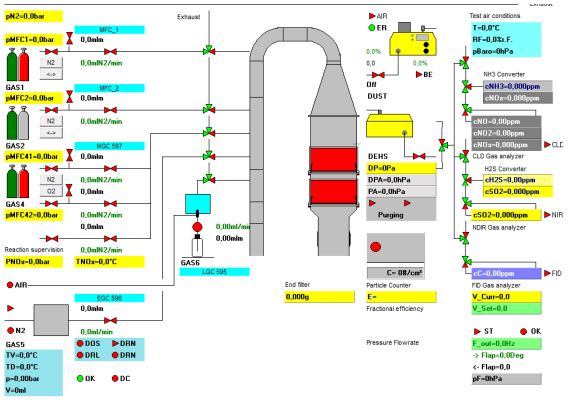
Molecular filter testing

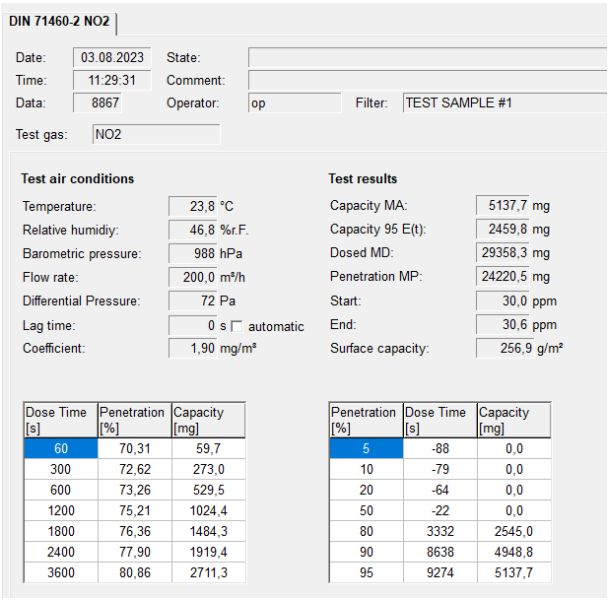
Software

Complementary, Topas offers a versatile and in-house developed software package for all test systems. The software enables the visualisation and control of the test system as well as the recording and processing of the logged data. The user can access all integrated instruments of the test system, adjust their settings and record, display and analyse the necessary data.



Web visualisation of the test system PAF 113.

For routine measurements, defined test sequences with step-by-step instructions are available to the user in the software. The recorded data is gathered and summarised in an automatically generated test report.



DIN 71460-2 NO2

Date:	03.08.2023	State:			
Time:	11:29:31	Comment:			
Data:	8867	Operator:	op	Filter:	TEST SAMPLE #1
Test gas:	NO2				

Test air conditions

Temperature:	23,8	°C
Relative humidity:	46,8	%r.F.
Barometric pressure:	988	hPa
Flow rate:	200,0	m³/h
Differential Pressure:	72	Pa
Lag time:	0	s ☐ automatic
Coefficient:	1,90	mg/m³

Test results

Capacity MA:	5137,7	mg
Capacity 95 E(t):	2459,8	mg
Dosed MD:	29358,3	mg
Penetration MP:	24220,5	mg
Start:	30,0	ppm
End:	30,6	ppm
Surface capacity:	256,9	g/m²

Dose Time [s]	Penetration [%]	Capacity [mg]
60	70,31	59,7
300	72,62	273,0
600	73,26	529,5
1200	75,21	1024,4
1800	76,36	1484,3
2400	77,90	1919,4
3600	80,86	2711,3

Penetration [%]	Dose Time [s]	Capacity [mg]
5	-88	0,0
10	-79	0,0
20	-64	0,0
50	-22	0,0
80	3332	2545,0
90	8638	4948,8
95	9274	5137,7

Displaying the results of a test with the test system PAF 113.

test system	PAF 112/ PAF 113	FCT 113	GAF 114
standard	ISO 11155	n.a.	ISO 10121
filter type filter size	filter elements < (300 × 600) mm	filter elements, filter assemblies < (500 × 700) mm	pocket, cassette and cartridge filters, filter assemblies < (610 × 610) mm
volume flow rate	70 ... 700 m^3/h	70 ... 1 400 m^3/h	400 ... 4 500 m^3/h
max. differential pressure	1 000 Pa	1 000 Pa	2 000 Pa
test gas	neutral: n-butane, toluene, acetaldehyde, ozone acidic: sulphur dioxide, hydrogen sulphide alkaline: nitric oxide, nitrogen dioxide, ammonia Other test gases can be integrated on customer request.		
test aerosol	DEHS, KCl, ISO 12103 A1 ultrafine and A2 fine	DEHS, KCl, ISO 12103 A1 ultrafine and A2 fine	-
sensors	organic gases: Horiba APHA 370 sulphur compounds: Horiba APSA 370; converter H_2S: Horiba CU-1 nitrogen compounds: Horiba APNA 370; converter NH_3 Horiba CU-2 Other measuring devices can be integrated on customer request.		

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