

## Filter Efficiency Measurement System

## FMS 374



Filter Efficiency Measurement System FMS 374

This simple filter media test setup is intended to be used for fast and low cost filter media characterisation with special focus on the current need of face mask media product development and production control.

Based on our long-term experience on fully automated turn-key filter media test systems we configured a table-top test setup which enables the operator to achieve filter media efficiency results with a minimum of instrumentation. This setup combines our core competence on aerosol generation, aerosol dilution and reliable filter media adaptation. It uses standard instrumentation and software components for fastest possible availability. Operation is done fully manually.

### Applications

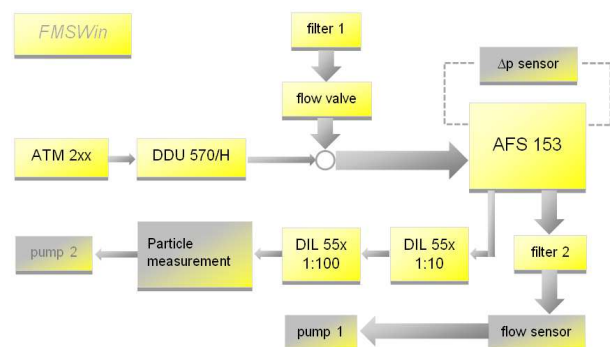
- basic filter media efficiency testing
- Bench marking and reverse engineering of filter materials
- Testing is NOT according to any mask testing standard or NIOSH certification

### Features

- Simple cost effective setup with components available with short-term availability
- Atomizer aerosol generator ATM 2xx for Paraffin oil or NaCl (with dryer) test aerosol
- Universal filter media adapter AFS 153 with variable connectors
- Two-stage dilution configured to the used particle measurement instrumentation

### Principle of Operation

The testing setup is operated in suction mode provided by a main vacuum pump. Filter media under test will be placed into AFS 153 filter holder. Correct test flow rate setting will be done by a flow valve setting based on the correct flow sensor reading. Inlet air and exhaust air are HEPA filtered. Depending on the test requirements an ATM 2xx is operated with paraffin oil or a NaCl solution. In case of NaCl aerosols a diffusion dryer is needed. Choice of ATM 2xx model depends on used particle measurement method. On-site available particle measurement instrumentation can be used or offered optionally. Required test aerosol dilution is done by a two stage DIL55x setup.



Schematic setup of FMS 374 with required additional components



## Specifications

### Details

The following components are parts of the standard FMS 374 delivery:

- ATM 2xx aerosol generator
- DDU 570/H diffusion dryer
- AFS 153 filter media holder
- DIL 55x ( 2 units, 1:10 + 1:100)
- Inlet and exhaust filter
- Flow valve, flow switch
- aerosol tube
- mask adapter plate

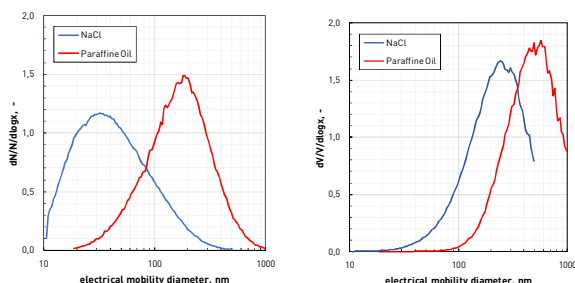
We can offer the following particle measurement instrumentation on request:

- LAP 322 laser aerosol spectrometer
- LAP 340 laser particle counter
- FMSWin software (runs with LAP 3xx and TSI CPC models)

The following components must be available on-site, we can also support the procurement:

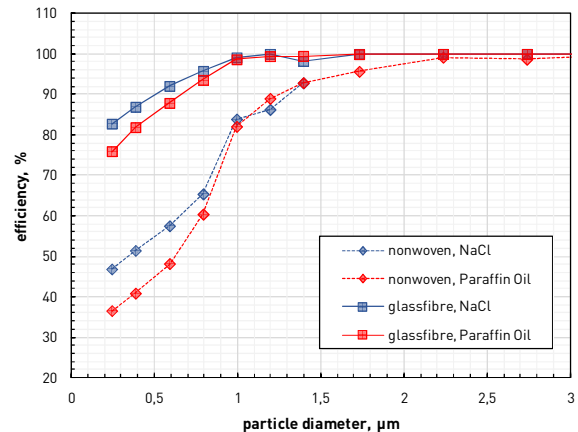
- primary vacuum pump
- flame photometer, scattered light photometer, condensation particle counter, optical particle counter with secondary sampling pump if required alternatively to LAP 3xx
- $\Delta p$  sensor
- flow sensor

The following particle size distributions will be resulting for paraffin oil and NaCl when generated by any ATM 2xx model.



number (left) and volume (right) weighted density distribution of Paraffin Oil (CAS 8042-47-5) generated by ATM 2xx

In case of using an optical sizing instrumentation with this setup it will be possible to achieve fractional efficiency curves as shown below. Optimisation of filter material can be done much better with fractional efficiency compared to total efficiency.



Fractional efficiency curves with NaCl and paraffin oil for two filter media samples as measured by FMS 374 with LAP 340

The following table shows the deviation of total penetration measured by different particle measurement methods at FMS 374.

aerosol	filter media	LAP 340	LAP 322	CPC	flame photometer	standard tester
NaCl	glassfibre	13,3	16,9	16,8	15,2	14,9
	nonwoven	48,1	49,8	32,3	51,3	n/a
Paraffin Oil	glassfibre	15,8	21,1	18,3	n/a	n/a
	nonwoven	55,1	60,4	58,2	n/a	n/a

Total penetration (%) measurement with FMS 374 with different particle measurement methods (yellow, different size measurement ranges, different principles) at two different types of sample compared to a standard mask filter media tester

### Technical specifications

Air flow rate	80...100 l/min
Aerosol Substances	DEHS, Paraffin Oil, NaCl
Sample cross section	100 cm <sup>2</sup>
Cycle time	1 ... 2 min
Power supply	115 ... 230 VAC
Compressed air supply	< 5 bar

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QMS certified according to DIN EN ISO 9001.



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