



Condensation Aerosol Generator SLG 270

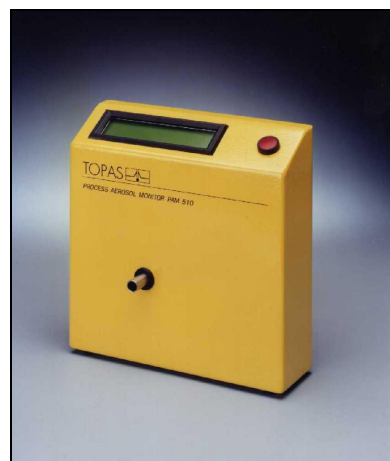
Special Advantages

- Generation of monodisperse aerosols with adjustable particle size in a wide range
- Constant high number concentration
- Very rapid response to desired changes of particle size
- Spherical and virtually electrically neutral particles
- Several particle materials can be used
- Easy and straight forward instrument operation

For various tasks in laboratory and research monodisperse aerosols are required. Aerosol generators of the series SLG produce such aerosols with definite properties in a wide range of particle size and concentration as well. Depending on the choice of the particle material either droplet or solid state aerosols can be generated. The patented innovative concept in combination with state of the art control instruments and regulators guarantees quick and reproducible adjustment of both particle size and concentration. Both parameters of the outlet aerosol can be continuously monitored by the process aerosol monitor series PAM 510.

Applications

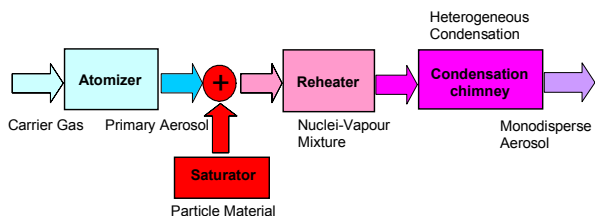
- Calibration of particle measuring instruments
- Aerosol research
- Filter testing
- Determination of separation efficiencies
- Inhalation and toxicology studies
- Generation of tracer particles
- Aerosol generator for seeding applications



Process Aerosol Monitor PAM 510 for Continuous Monitoring of Particle Size and Concentration of the SLG Condensation Aerosol Generator

Principle and Performance

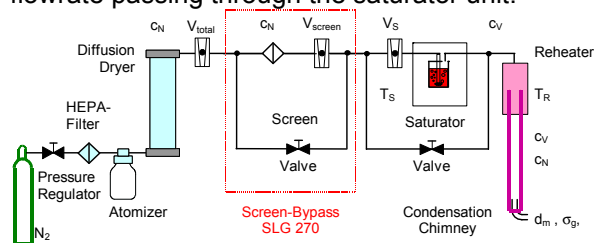
The aerosol generation principle used in the series SLG is based on the principle of the controlled heterogeneous condensation of vapour onto separately produced condensation nuclei after Sinclair-La Mer (as described by VDI guideline 3491 part 4). By means of an **Atomizer**, a primary aerosol consisting of small particles serving as condensation nuclei dispersed in the carrier gas is produced. This primary aerosol is mixed and saturated inside the **Saturator** with the vapour phase of the material to be used as particle material. The **Reheater** section is used to heat up the mixture to definite temperature level in order to avoid premature condensation and to reach reproducible supersaturation conditions at the entry of the **Condensation Chimney** where controlled condensation of the particle material onto the nuclei is performed in a laminar flow regime.



Schematic of the Principle of Controlled Heterogeneous Condensation according to Sinclair-La Mer

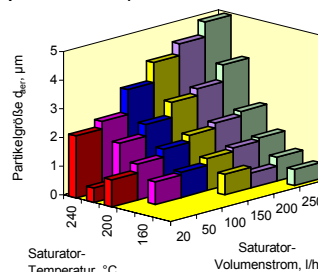
As nuclei source a stainless steel atomizer (Patented GM 94 08 604) in combination with a diffusion dryer is used. The atomizer produces a spray of low concentration aqueous sodium chloride solution. After drying off the droplets by passing them through a dryer a nuclei aerosol with high number concentration and mean particle size of 90nm is available. The nuclei aerosol is mixed with vapour of the low volatile substance to be re-condensed onto the nuclei. Inside a thermostatically controlled saturator vessel thermodynamic equilibrium at the phase boundary of the aerosol substance is produced corresponding to the saturated vapour pressure dependency of that specific substance. The reheater unit evaporates completely the vapour and ensures controlled heterogeneous

condensation starting inside the aircooled condensation chimney after supersaturation has been reached. The resulting mean particle size depends on the ratio of vapour concentration to nuclei number concentration. The vapour concentration and consequently particle size can be controlled by varying the temperature of the saturator vessel and/or the proportion of the total flowrate passing through the saturator unit.



Flow Scheme of the series SLG

Special features of the aerosol generators of the series SLG are the saturator flowrate adjustment for rapid particle size changes and the nuclei concentration reduction in a definite manner by means of the screen section at the SLG 270 (Patented 43 12 983). Varying the saturator flowrate and its indication at a flowmeter in opposite to time consuming changes of the saturator's temperature enables fast and reproducible adjustment of desired particle sizes. By means of reducing the nuclei concentration at the SLG 270 consequently the output concentration can be adjusted and the resulting particle size range can be extended to larger particles (8µm DEHS).



Adjustable Particle Sizes in Dependency on Saturator Flowrate and Saturator Temperature (DEHS)

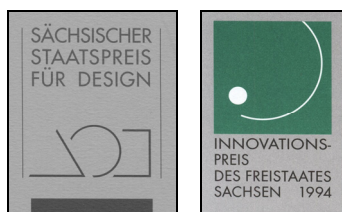
Design and Details

The technical solution of the generator series SLG was made for easy and straight forward operation. All units inside the instrument are easy accessible through doors from both sides. The nuclei source consisting of an atomizer and diffusion dryer can easily be dismantled as a complete unit e.g. for replacing the dessicant inside the dryer.



Left: Dismounted Nuclei Source (Atomizer and Diffusion Dryer) for Replacing Dessicant (Silicagel) through the Inlet on the Top
Right: Removing Saturator Vessel for Refilling with Particle Material

The saturator vessel can simply be refilled. The aerosol material inside the saturator is directly heated which enables fastest response to temperature changes as well as high grade control stability (<1K). Nitrogen is used as a carrier gas and is connected to the inlet through a pressure regulator. Other inert gases are possible.

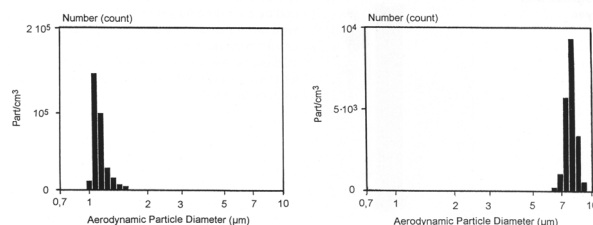


Award Labels Decorating the SLG

The condensation aerosol generators of the series SLG are designed for flexible use in laboratory as well as for research and development. Their technical solution and design has been appreciated by many satisfied customers and was

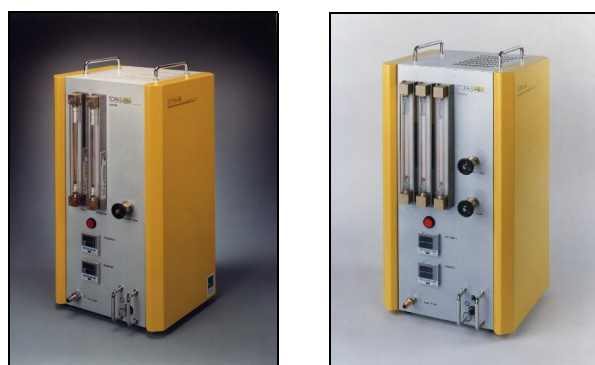
multiply awarded e.g. 1993 with the “Saxonian Government Award for Design” and 1994 with the “Innovation Award of Saxony”.

By changing operation conditions (flowrate, temperature) monodisperse aerosols within the size range as given by the thermodynamic properties of the material to be used can be adjusted in few minutes.



Monodisperse Particle Size Distributions of Aerosols of DEHS Generated with an SLG at Different Operation Settings

Two models of the series SLG are available. For covering an extended particle size range as well as for adjustment of particle concentration the SLG270 has additionally been equipped with a nuclei reduction section, the screen bypass.

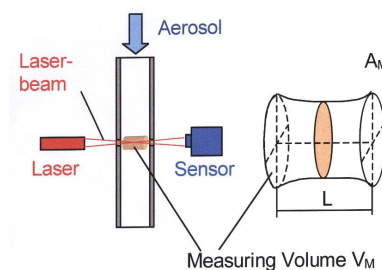


SLG250 and SLG270 Featuring the Screen Bypass Section for Larger Particles (To be Seen at the Additional Flowmeter and Second Valve for Screen Bypass Adjustment)

Specifications

DEHS	Particle Size Range	0.1 ... 5µm (8µm)
Stearic Acid		0.1 ... 6µm (12µm)
Carnauba Wax (solid)		0.1 ... 3µm (5µm)
Other Tested Materials	Emery 3004, Engine Oil 15W40, Paraffines	
Geom. Stand. Dev.		<1.15
Number Concentration		10 ⁶ Particle/cm ³
Total Flowrate		200 ... 250l/h
Saturator Temperature		Up to 400°C
Reheater Temperature		Up to 400°C
Carrier Gas		Nitrogen 250l/h@5bar
Power Supply		110...240VAC 50...60Hz
Dimensions		550 × 300 × 250mm
Weight		17kg (19kg)

Especially for monitoring the monodisperse output aerosol of condensation aerosol generators the process aerosol monitor PAM 510 has been developed. This instrument continuously detects particle size as well as concentration simultaneously even at highest number concentrations. The innovative measuring principle is based on measuring average light extinction and their fluctuation in a very small sensing volume homogeneously filled up with the aerosol to be characterized.

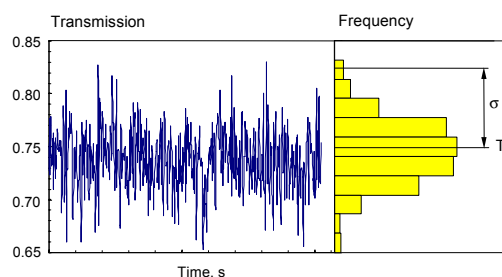


Under the assumption of monodisperse particle size distribution this optical reading technique delivers by means of the Lambert-Beer law both particle size and concentration. Via standard serial interface at the PAM 510/S and special software PAMWin measuring data can be transferred to a PC for further evaluation and presentation.

Values in Brackets () are for SLG 270



Online Monitoring of Particle Size and Concentration the Monodisperse Aerosol with the Process Aerosol Monitor PAM 510 Directly Connected to the Outlet of a SLG 270



Analog Signal Generated by Monodisperse Aerosol due to Fluctuation of Number of Particles inside the Sensing Volume (T : Average Transmission, σ : Standard Deviation of T)

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

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