

INFORMATION FOR CUSTOMERS AND PARTNERS OF PALAS[®] GMBH

Calibration – do it right!

Palas® has developed a portable calibration system for particle counters



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The entire spectrum in air filter media testing, starting at very low efficient open media up to ULPA qualities, can be carried out with the different versions of the MFP series. **Page 3**

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With this universally applicable condensation particle counter different working fluids can be used without changing the hardware. **> Page 3**

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25th Palas[®] ATS 2011

Information and entertainment at the 25th anniversary of the annual Aerosol Technology Seminar. ▶ Page 4

► With the new reference aerosol distribution system RAS 3000 Palas[®] has developed a calibration system, with which the user can compare on site its particle counters in relation to a reference measuring device in an easy, fast and inexpensive way. ► Page 2



Dear Readers,

► In this issue of our newsletter we would like to draw your attention to the topic calibration. Reliable and comparable measurement results can only be achieved with correctly calibrated devices – for this purpose we have developed a new solution.

Today we are selling our products from the aerosol and particle technology to companies, universities and research institutions worldwide. Therefore we continuously expand our distribution network. This year alone we gained three new sales partners, providing you with expert consultation. An overview of our distribution network is available in this newsletter.

In spite of the positive trend, the continuous rise in prices during the last years left its mark on us. In the last ten years we have kept the prices constant - especially by selling more items and by optimizing the production - but from next year we are unfortunately forced to adjust our prices accordingly. Thank you for your understanding.

Leander Mölter Managing Director of Palas® GmbH

Calibration – do it right!

Palas[®] has developed a portable calibration system for particle counters

▶ To calibrate means to compare. During the calibration the measurement devices under test are compared to a reference measurement device. It should be noted that in all device characteristics the reference measurement device should be better than the tested measurement devices. It goes without saying, only calibrated measurement devices provide reliable and comparable results. "In practice however, users often don't know how the calibration of their particle counters was performed, so Palas® Managing Director Leander Mölter. A calibration certificate is available for each instrument, but the user often has no knowledge, on which basis the calibration was done. Therefore, so Mölter, all devices have to be calibrated under the same conditions, if the results should be reliable and comparable. "This has led us to develop a new calibration system on the basis of our recently developed Reference Aerosol distribution System RAS 3000, with which the user can determine on site the counting efficiency differences of its particle counters in relation to a reference measurement device in an easy, fast and inexpensive way.

Measurement principles such as counting that is used in optical particle counters (OPCs) or optical aerosol spectrometers (OAS) offer the advantage, that they can determine the particle size and the particle concentration simultaneously. Today various manufacturers are offering different OPCs and OAS in various technical designs for different applications. OAS for example are used to measure the particle size distributions of aerosols, sprays or for the characterization of test aerosols, for filter testing and for the measurement of atmospheric aerosols. Here, Palas® offers the welas[®] digital and the Promo[®] systems, which can determine directly and reliably the particle size distribution in high particle concentrations up to 10⁶ P/cm³ without dilution systems. OPCs have been developed for the characterization of cleanrooms. These devices have to determine reliably rather few incidents in a short time. Therefore OPCs often have a high suction volume flow of 28.3 l/min up to 50 l/min. By comparison, OAS have a lower suction volume flow of approximately 0.28 l/min to 5 l/min. The requirements of an OPC for the determination of the particle size distribution are less demanding in comparison to an OAS. OPCs have been developed further and optimized for various applications. Various OPCs,



ACA 1000

with their appropriate device characteristics, are used for the verification or classification of cleanrooms into various cleanroom classes.

ISO 21501-1 defines quality characteristics

For the comparability of various, worldwide available OPCs, objective quality characteristics are necessary. These quality characteristics have been defined approximately three years ago in the standard ISO 21501-1. This standard defines the counting efficiencies, the size resolution capacity, the size classification accuracy, the zero counting rate as well as the maximum measurable particle number concentration, which is necessary for a coincidence-free particle measurement.

The quality of an OPC, such as the lower detection limit, the number of size classes, the exact volume flow and the maximum measurable particle concentration, is decisively influenced by the quality of the optoelectronic components, e.g. the light source, the angle-dependent light scattering and the clearly defined calibration curve. An important characteristic is the counting efficiency, which informs about how many particles are counted in comparison to a reference measurement device.

RAS 3000 for the calibration of the counting efficiencies of OPCs

With the new Palas® RAS 3000 the counting efficiency differences between up to six OPCs and up to five OPCs in comparison to a reference measurement device can be determined fast, reliably and inexpensively. The time for calibration is typically less than one hour.

The RAS 3000 consists of an aerosol generator with very low number concentration output and an aerosol distribution system with six aerosol outlets and six sampling cylinders. At each of the six aerosol outlets, the same number concentration ± 3 % is provided. If no clean, particle free pressurized air with a constant volume flow is available on site, Palas[®] recommends to use the ACA 1000 (Adjustable Clean Airstation), which delivers a steady and high volume flow of e.g. 180 l/min ± 1 %.

The RAS 3000 provides defined, fast, reproducible and economical calibration for particle counting instruments

The RAS 3000 contains an integrated aerosol generator for the generation of a temporally very stable polydisperse aerosol with:

 $C_{nmax} = 35 \text{ P/cm}^3 = 35 \times 10^6 \text{ P/m}^3.$

At these concentrations the OPCs can be calibrated without aerosol dilution. With the reference particle measurement device (RPM) the variances in number concentration are determined and recorded at all six aerosol outlets. Then, up to five OPCs can be connected to the RAS 3000 at the same time and the number concentrations can be measured. Each of the measured number concentrations at the respective outlet cylinder (AAZ_{1.6}) is finally corrected with the previously determined values with the RPM.

By its nature of being a relative calibration, this calibration method is only dependent on the stability of the used components like the aerosol generator, the aerosol distribution system and of course the reference particle measurement device. The RAS 3000 provides defined, fast, reproducible and economical calibration for particle counting instruments. With this system the users of OPCs can check the work of calibration service providers. Another field of application of the RAS 3000 is the determination of the protection degree of operation rooms according to SWKI 99-3.

New: Test rig MFP Nano *plus* for the determination of the separation efficiency of filter media according to EN 1822-3

► Two years ago the version MFP 1000 HEPA for the determination of the fractional efficiency of HEPA filter media according to EN 1822-3 in the size range of 120 nm to 40 µm with the aerosol spectrometer system welas[®] digital has been presented and successfully introduced into the international market. With the development of the U-SMPS system (measuring particles in the size range of 5 nm up to 1 µm), a new high-performance measuring system is now available, integrated into the MFP.

The new MFP Nano *plus* with the integrated U-SMPS can test filter media with salt aerosols as well as with oil droplets, e.g. DEHS. By choosing the adequate solution concentration in the aerosol generator the mean generated particle size is precisely defined. Thus, the system can be matched to an optimum counting statistic for the particular MPPS range (Most Penetrating Particle Size).

The polydisperse test aerosol is classified with the DEMC (Differential Electrical Mobility Classifier), so that only monodisperse particles of a particular size can get on the filter media for the determination of the efficiency. This procedure minimizes loading effects caused by the test aerosol on the filter medium at the downstream measurement. The new Palas® condensation particle counter UF-CPC 50 then determines fast and reliably the appropriate particle number concentration to each particle size. The UF-CPC 50 uses a large optical measurement volume and is therefore optimized for highest counting rates in very low aerosol concentrations.



Determination of the MPPS range with different filter media of the same type at various days.

The very high particle concentration in upstream is reduced for the measurement by welldefined dilution systems. The integrated dilution cascades enable dilution factors of 10, 100, 1000 und 10000. For the simple switching between upstream and downstream measurement an automatic upstream/downstream switch is provided.

The cleaning effort at the dilution cascades is minimized by using two simple moveable dilution cascades, one for salt aerosols and one for DEHS. This leads to a fast, economic and defined determination of the filter efficiency according to EN 1822-3.

The series MFP for the evaluation of the dust holding capacity, the pressure loss and the efficiency of filter media has been proven to the entire satisfaction of our customers for years. The entire spectrum in air filter media testing, starting at very low efficient open media up to ULPA qualities, can be carried out with the different versions of the MFP series.

Flexible UF-CPC with different working fluids

► The universal fluid condensation particle counter UF-CPC measures the total number concentration of airborne ultrafine and nanoparticles. First, these particles are enlarged via condensation and are then detected optically.



In the standard mode, the UF-CPC is a reliable condensation particle counter which can be operated intuitively via touchscreen. In the expert mode, additional parameters like temperature settings can be changed with a touch on the screen.

A unique feature of the Palas[®] UF-CPC is the patented active circulation of the working fluid that allows the user to change the fluid from e.g. butanol to other alcohols or even water. Due to this flexibility the UF-CPC can be used to analyze the condensation process of different aerosols with different working fluids, without changing the hardware. By choosing an appropriate working fluid it might even be possible to differentiate a specific material from the aerosol background. The analysis of the condensation process is facilitated by the fact that the UF-CPC also provides the droplet size distribution at any time and with high resolution. Thus, the user receives a direct feedback about the condensation process and could further optimize it by varying the saturator/condenser temperature, the volume flow, or the circulation velocity of the working fluid.

Butanol can cause skin irritation and has other adverse health effects when inhaled over a prolonged period.* With the UF-CPC as testing platform, also more environmental-friendly working fluids can be used.

*according to safety data sheet about 1-butanol

Further information can be found under: www.palas.de/en/product/particlemeasurement

Fidas[®] mobile further developed



The new portable real-time dust monitor Fidas[®] mobile was updated. It is equipped now with a more powerful battery which allows the user to operate the instrument up to three hours without power supply. The efficiency of the LED light source has been improved further, so that the counting efficiencies for very small particles have increased.

► PALAS[®] DEVELOPMENT

Monodisperse calibration particles for particle size measurement devices

▶ In the guideline VDI 3867 "Measurement of particles in ambient air - Determination of particle number concentration and number size distribution" as well as in ISO 21501 "Determination of particle size distribution - single particle light interaction methods" the most important device characteristics of aerosol spectrometers are described. With the device characteristics - particle size resolution and particle size classification accuracy - the quality of aerosol spectrometers and of particle counters can be explicitly proven and compared.

In the size range of approximately 60 nm to 10 µm certified latex particles and PSL particles from suspension are often used for size comparisons. This is time-consuming, difficult and expensive for particles larger than approximately 2 µm.

In the size range of approximately 0.25 µm - 8 µm the Sinclair LaMer generator MAG 3000 offers special advantages: it generates fast, easily and inexpensively the desired test particles. In the size range of approximately 10 µm - 100 µm the spherical microparticles from Dr. Lerche - dispersed with the Palas® powder disperser RBG 1000 - offer special advantages: they can be generated as test particles in a fast, easy and inexpensive way.

cles from Dr. Lerche.



REM-pictures provided by MANN+HUMMEL

▶ In addition to aerosol generators we can ▶ Palas® also offers the service to calibrate now offer our customers monodisperse parti- aerosol spectrometers and particle counters in its calibration channel.

▶ PALAS[®] INTERNAL

Palas[®] sales partners – worldwide available for you!



In more than 60 countries the technology of Palas® is being used successfully. In order to grow with the demand and ensure expert consultation for our customers on site in their local languages, we are continuously expanding our distribution network.

Become a sales partner!

After developing our presence in Southeast Asia and India, we are now looking for partners in the regions South America, Eastern Europe and South Africa.

The sales partnership is ideally suited for young, motivated engineers who are futureoriented and intend to start their own business. Besides a solid physical-technical background, experience in the field of aerosol physics/filter testing and a good network of contacts, we expect the willingness to participate at trainings at Palas[®].

The contact information of our sales partners is available at www.palas.de/en/contact/reseller.

► PALAS[®] AGENDA

Palas® attends regularly conferences and exhibitions. The up-to-date details can be found on our website:

www.palas.de/en/exhibition.

We already booked a booth at the following events:

- WFC 11, Graz/Austria 16. - 20.04.2012 (booth no. B3 + C3)
- ACHEMA 2012, Frankfurt/Germany 18. - 22.06.2012 (booth no. D53)
- ▶ 8th China International Filtration and Separation Exhibition, Beijing/China 08. - 10.08.2012
- Please reserve: 26th Aerosol Technology Seminar 24. - 25.09.2012, Karlsruhe/Germany

25th Palas[®] ATS 2011



▶ Palas[®] celebrated the 25th anniversary of its Aerosol Technology Seminar (ATS) on the 12th and 13th September 2011. In the Schlosshotel Karlsruhe specialists presented the latest insights and results in their fields of nanoparticle measurement, fine dust and environmental measurement technology, calibration of particle measurement devices, bio aerosols, filter testing and standardisation. The scientific program was accompanied by an attractive evening program, which also provided the chance to exchange ideas and experiences.

► PALAS[®] CONTACT

Palas[®] GmbH

Greschbachstr. 3b 76229 Karlsruhe, Germany Phone: +49 721 96213-0 Fax: +49 721 96213-33 E-Mail: mail@palas.de www.palas.de

Editor

Judith Liebig and Julia Ohmenzetter Words and Layout

Andreas Mauritz - Public Relations

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