



22nd July 2021

INFORMATION RELEASE 2107-22

Dear Customer,

Re: AS1807:2021 and AS/ISO14644-3:2021 standards concerning aerosol photometers and their calibration requirements.

Further to our previous information release 2107-12 dated 12th July 2021 please find below more information.

Changes to the recently released AS1807:2021 SPECIFICALLY related to the use of Aerosol Photometers for various tests **require changes** to the operation and calibration of those instruments to meet the new requirements.

There are other changes to the mentioned standard you probably should be aware of, but we do not discuss them in this document. We suggest that you have a good read of this new standard and have it to hand for reference. The change we are focusing on is the new requirement to measure and record the upstream concentration in gravimetric units ($\mu\text{g/L}$), sections 4.4.5.2 c) and 4.4.7 d). The standard is slightly confusing by defining concentration in two ways which are the same ($100\mu\text{g/L} = 100\text{mg/m}^3$).

It is important to understand that:

The "Aerosol Photometer" as we know it today was never designed or intended to be used as a gravimetric measure. This instrument measures and reports "% light scattering" referenced to a "100% reference". So far, we can trace its origins to 1922 (NYO-512 – *"Studies of filtration of monodisperse aerosols"* by Victor K. La Mer), STILL using the same optical design from before 1945 when it was called a "Light Meter". It is technically more accurately called a "Nephelometer" and best described by Thermo Systems Report back in 1971, see below:

Photometers, often called nephelometers, perform their measurement on a cloud of aerosol particles by light scattering. They are useful for measuring aerosol concentration. In a photometer, a light beam shines through the cloud of aerosol particles. A photomultiplier measures the intensity of light scattered at a certain angle by the particles. The intensity of the scattered light depends on the particle size and concentration, on the optical characteristics of the light beam. Correlation with particle mass concentration requires that all these parameters except concentration remain constant. Photometers can measure aerosol clouds with considerably higher concentrations than can the optical counter.

D. Conclusions

These techniques cannot measure the mass concentration of airborne particles. Correlation of these measurements with particle mass concentration is very poor. These instruments share most of the problems of light transmission instruments and also have several additional problems for particle mass concentration monitoring. Optical counters may be useful for particle size distribution measurements of stack effluents after development of a sample conditioning system. Photometers may find specialized research application for measurement of stack effluents.



GraviCal

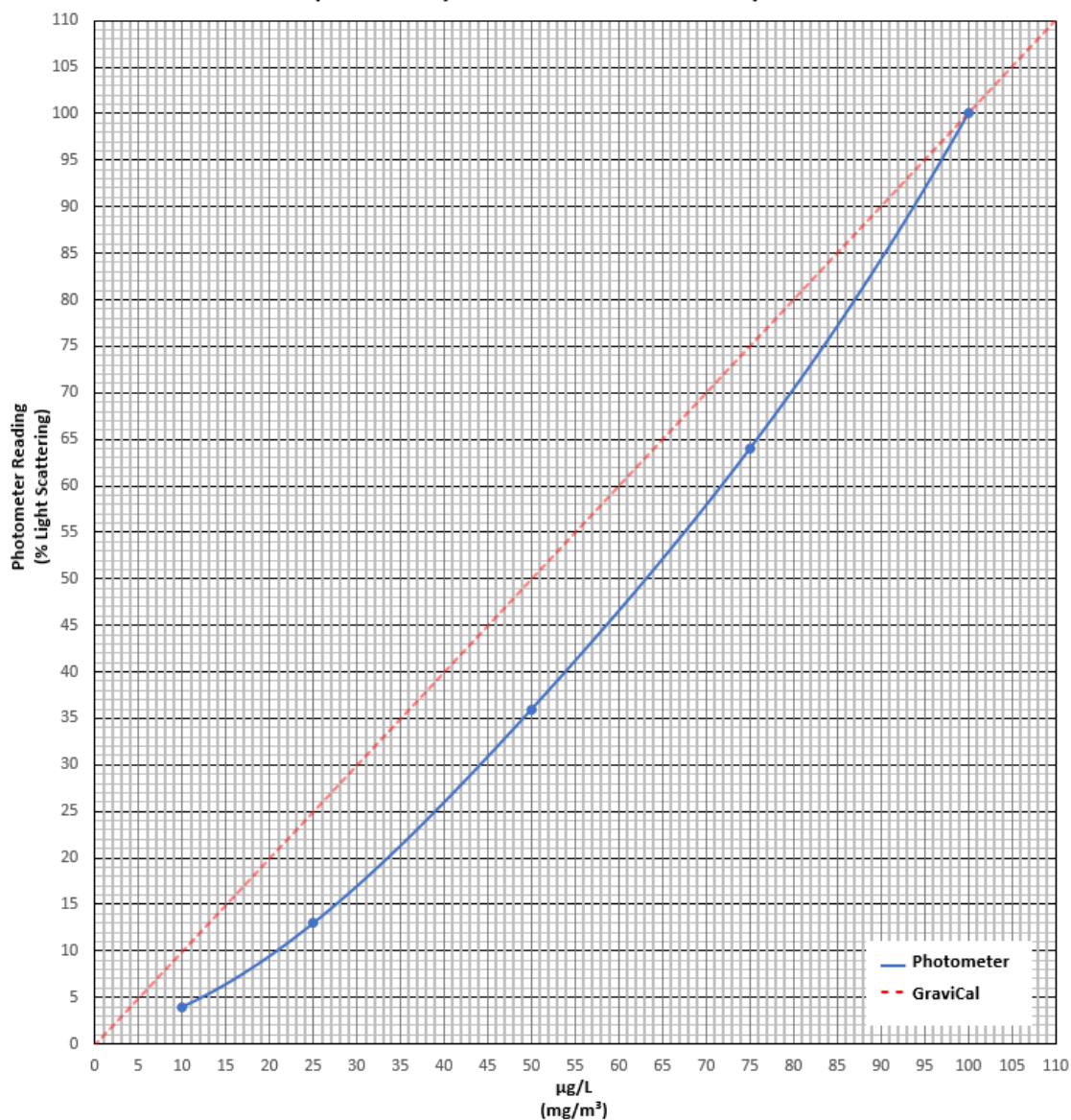
Over 12 months research has resulted in a new calibration system - GraviCal - which can produce a gravimetrically calibrated source of polyalphaolefin (PAO4) with a controllable concentration range from $1\mu\text{g/L}$ to more than $110\mu\text{g/L}$. We are currently working on calibrating the lower ranges, but this is difficult with standard laboratory equipment.

Results

We have assessed most brands of "Aerosol Photometers" and have found none to be linear to the balance ($\mu\text{g/L}$) which is a known issue when a quantity is measured indirectly (refer to "D. Conclusions" bottom page 1).

An example of the "GraviCal Calibration Graph" to be supplied by Fotometrix Pty Ltd as part of the new calibration report is shown below.

Calibration Graph
Report XXXXX/XX - Aerosol Photometer S/N: XXXXX





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This graph will allow the operator to determine the gravimetric concentration from the meter display when the instrument is referenced to the calibrated "100% reference". For traceability purposes, we recommend recording the instrument meter reading as well as the upstream concentration mix required by the standard.

What does this all mean???

- Fotometrix will soon be able to provide a traceable, gravimetric calibration for most "aerosol photometers".
- Most instruments will require modifications and/or reprogramming.
- Some instruments will not be capable of being used at upstream concentrations less than 10µg/L (as stated in AS1807:2021 and AS/ISO14644-3:2021).
- Testing procedures, instrument setup and operation procedures will all need updating.

Due to the high information demand, should you have any questions or require further assistance, please email us.

Thank you and regards,

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Since 1987, the specialists in calibration of particle counters and aerosol photometers.

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