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WHY UNCERTANTIES MATTER

Which calibration laboratory would you use…?

When deciding which calibration laboratory to use for the calibration of your Particle Counters, Aerosol Photometers and Microbial Air Samplers there are a number of factors to consider, for example: turnaround time, service price, supplier responsiveness, etc., however one of the most important factors to be considered is the calibration uncertainties reported by the calibration laboratory as per their scope of accreditation CMC[1].

The uncertainties in calibration certificates are very important. They are there to inform you, the customer, of the capability of the calibration laboratory to accurately and precisely measure and calibrate your instruments. Logically, the lower the calibration uncertainties are, the more accurate and precise will be your measurements and subsequent reports. Lower uncertainties are even more important if you are propagating measurements for traceability and full ISO/IEC 17025 compliance.

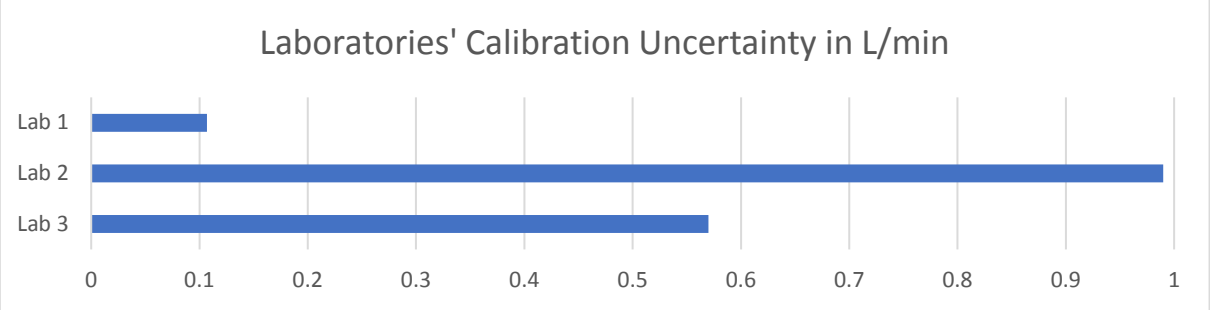
As an example, see below a table comparing the air flow rate CMC[1] or uncertainty capabilities from the NATA website of the three only ISO/IEC 17025 certified calibration laboratories, accredited for the calibration of Aerosol Photometers in Australasia.

(Note, for the purposes of this comparison the tables below show only the Aerosol Photometer related section of each scope of accreditation).

Table 1		
Lab 1	Lab 2	Lab 3
0.03 L/min at a flow rate of 2.50 L/min increasing linearly to 0.35 L/min at a flow rate of 110.00 L/min	3.5 % of reading at flow rate at 28.3 L/min	0.57 L/min at 28 L/min

The table below shows each laboratories' CMC's, again **only for Aerosol Photometers** converted to the same units (L/min) for an easier comparison.

Table 2		
Lab 1	Lab 2 *	Lab 3 **
0.106 L/min at 28.0 and 0.107 L/min at 28.3 L/min	**0.99 L/min at 28.3 L/min**	**0.57 L/min at 28 L/min**



[1] A Laboratory Calibration and Measurement Capability (CMC) is the lowest level of uncertainty a calibration laboratory can achieve under routine conditions, listed in their accreditation scope. It defines the high-level quality of measurement services, factoring in uncertainty contributors like repeatability, operator skill, and equipment stability.

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Notes from Table 2

* **Lab 2**: apart from the significantly LARGER uncertainty compared to the other two laboratories, the CMC[1] in their scope of accreditation does not provide a range, which limits this laboratory to report an Aerosol Photometer's air flow rate on an ISO/IEC 17025 NATA endorsed certificate ONLY WHEN it is PRECISELY 28.**3** L/min. This means that if an Aerosol Photometer's air flow rate in either the As Found and/or the As Left measurement is anything other than PRECISELY 28.**3** L/min, the value cannot be reported and effectively the Aerosol Photometer is then uncertified and consequently the instrument cannot be used for certification.

** **Lab 3**: in this case, the CMC[1] in their scope of accreditation again does not provide a range which again limits this laboratory to be able to report the Aerosol Photometer's air flow rate on an ISO/IEC 17025 NATA endorsed report ONLY WHEN it is PRECISELY 28.**0** L/min. This means that if the Aerosol Photometer's air flow rate in either the As Found and/or the As Left measurement is anything other than PRECISELY 28.**0** L/min, the value cannot be reported and effectively the Aerosol Photometer is then uncertified and consequently the instrument cannot be used for certification.

Furthermore, the limitation encountered above in both **Lab 2** and **Lab 3** could present issues for the instrument's end user depending on which certification standard is being used. For example, when testing for compliance with AS 1807, the nominal air flow rate requirement shall be 28.**0** L/min ±3 L/min (page 7 item 3.7) not 28.**3** L/min and when testing for compliance with ISO 14644.3, the nominal air flow rate is based on a sample air flow rate of 28.**3** L/min or 1 CFM (page 29 item B.7.3.2) not 28.**0** L/min…

Also another very important factor to consider is the calibration laboratory reporting precision which for **Lab 1** is two decimal places, for **Lab 2** is only one decimal place and for **Lab 3** is zero decimal places.

In summary

It is always good practise to compare different suppliers for the calibration of your instruments however all factors must be considered especially those that really matter for the correct and accurate functionality of the instruments like the mentioned calibration uncertainties.

All the information in this document is available at the NATA website and can be accessed by anyone at any time.

HERE and **HERE** you can also find very useful NATA documents that can help you understand uncertainties and how to choose the best calibration laboratory for your needs.