

Is Your Humidity Calibration Lab Competent?

Find out by asking these 8 critical straight forward questions.

Question 1 – Is the lab accredited to the ISO 17025 standard?

Accreditation to the ISO/IEC 17025 standard for competency and testing calibration is a really good place to start. In general, accreditation

does not specifically say how the calibration should be performed, but rather it speaks to a set of guidance principles and results that the approved

procedures should provide. ISO/IEC 17025 accreditation confirms that the calibration laboratory has successfully addressed five major areas within the calibration process; Scope of Competencies, Properly Defined Procedures, Demonstrated Control of the Process, Demonstrated Understanding of the Measurement Uncertainty, Demonstrated Proficiency in the Measurement. The ISO 17025 accreditation ensures that your calibration vendor has given serious management and



technical attention to their capabilities and can repeatedly perform calibrations to that same level of competence. Although accreditation is a strong indicator that the lab is competent, accreditation or lack thereof should not be the sole indicator of competence.

Question 2 – May I see the uncertainty budgets for the humidity calibration process?

Ask the calibration lab vendor for the details on the uncertainty study. When considering the uncertainty of the calibration for humidity, the lab should have examined the following sources: the reference

instrument uncertainty, repeatability and drift of both the temperature and humidity reference instrument, the temperature and humidity gradients that are occurring inside the humidity chamber, the temperature and humidity stability within the chamber where the devices will be placed and the resolution of the unit under test (UUT). The lab should be capable and willing to explain their calculations on uncertainty and what assumptions went into the calculations. If they are unwilling or unable to do so, you should probably ask why and maybe start looking for another lab.

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ROTRONIC UNCERTAINTY BUDGET		
Measured Parameter or Device Calibrated	Range	Uncertainty (k=2)
THERMODYNAMIC		
HUMIDITY UNCERTAINTY		
Humidity Measurement Relative Humidity	0.1 % RH to 0.8 % RH	0.21 % RH
	10.5 % RH to 11.5 % RH	0.22 % RH
	34 % RH to 36 % RH	0.29 % RH
	79 % RH to 81 % RH	0.49 % RH
TEMPERATURE UNCERTAINTY		
Thermometer Probe	21 °C to 27 °C	0.065 °C

Question 3 – What type of reference instrument do you use? What is the traceability chain to a national standard?

There is a wide variation in the type of reference instruments used in humidity calibration labs. On the temperature side, temperature is a much easier parameter to measure, and generally speaking, temperature reference instruments are quite good. The range of quality and uncertainty in a



reference relative humidity instrument can vary widely. Ask yourself if these instruments are qualified to be a humidity calibration standard. Evaluation criteria should include the cost of the instrument. Is the lab using a \$200 instrument or are they using a \$30,000 chilled mirror? Ask the lab how often the reference is calibrated. The reference should be calibrated at least once per year. Ask to see the calibration certification and look for the chain of traceability to a national standard like

NIST. Ask the lab manager if they use redundant instruments for measurement and control or only one instrument for both?

Question 4 – Why are redundant instruments important?

A primary standard in the humidity world is a chilled mirror, but not all labs will use a chilled mirror due to a variety of operational difficulties. They will use something called a transfer standard, such as the humidity probe calibrated against a primary standard, such as a chilled mirror. If they use only one humidity probe for the comparison there is no way of knowing if that single humidity probe has drifted out of tolerance. A competent lab will use two probes next to one another which are both calibrated against the same reference and agree with each other. If one of them starts to drift, there will be an obvious mismatch and that mismatch will be investigated.

Question 5 – Is the lab environment controlled for both temperature and humidity?

The lab environment is critically important for proper calibration of a humidity instrument. Visit the lab and observe the placement of the actual lab. Are there any outside walls or windows in the lab? A lab with a Southern-facing window, for example, is likely to have huge swings in temperature at different times of the day.

Regardless of the humidity chamber design, swings in temperature in the calibration lab will result in temperature changes inside the calibration chamber. When this occurs, the relative humidity in the chambers will always chase the set point instead of reaching the set point. Avoid using a lab without a robust and self-contained temperature and humidity control system.

Question 6 – How is the humidity measurement environment created and maintained?

Again, visit the lab, observe and ask questions. Ask about how the airflow passes across the sensor. Ask about how temperature gradients are avoided. Still air is an excellent insulator. If the environment inside the humidity chamber is not sufficiently mixed, there will be significant temperature gradients. Find out how the different levels of humidity are generated. Although any one method of generating humidity should not be a disqualifier, it is important that the lab manager understands and is able to explain the generation process.

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Question 7 – May I see your written humidity calibration process?

An ISO 17025 accreditation assures you that the lab has written procedures and has proven to an independent auditor that they follow those procedures. If the lab is not accredited, then you are your own auditor. Ask to see the actual written calibration procedure. Observe a technician performing a calibration and evaluate the technician to see if they do actually follow the procedure to the letter. If the lab cannot produce the written procedure or the technician does not follow the procedure, warning bells should ring.



Another important question is how long are the humidity sensors allowed to soak in the reference environment. If there are changes in temperature at a new set point, the soak time must be significantly increased when compared to the change only in humidity set point.

A few more questions to pose to the lab manager: How is humidity and temperature equilibrium determined? Does the operator make the decision or is it evaluated with software? These points impact the repeatability of calibrations to a very significant degree.

By this point in time, you should be getting a pretty good idea regarding the competence of this particular calibration lab.

Question 8 – How do you select and train the calibration lab technicians?

Ultimately, the reliability of the calibration comes down to the competence of the person conducting the calibration. The experience and skills of the technician are paramount to a proper calibration. Lab technicians should be trained on a regularly scheduled basis and the lab manager should be able to produce records documenting that training occurred and who attended the training.



Conclusion

Properly and accurately calibrating and adjusting relative humidity equipment is no simple task. There are so many variable factors that impact the calibration it is very important that you ensure that your calibration vendor understands the factors and has taken the proper steps to address these issues. Ask your vendor these eight tough questions and remember, an ISO 17025 accreditation is only just a beginning.