

## Laboratory Testing Requirements and Accreditation

This Technical Note covers the accreditation requirements for independent laboratories seeking to submit test results to the Lighting Global Quality Assurance program and for manufacturers who would like to use these labs to test pico-powered lighting products

*This article builds on previous Technical Notes available on the Lighting Global website.*

### Introduction

Prior to January 2014, all pico-powered lighting products participating in Lighting Global's quality assurance program were sampled by Lighting Global directly and tested by a small number of independent laboratories pre-approved and under contract to perform the specific tests in Lighting Africa's Quality Test Method (QTM). This process helped to ensure consistent results and allowed for direct collaboration between the test laboratories and Lighting Africa researchers developing and refining the test methods.

In 2013, Lighting Global translated the QTM into the international test standard IEC 62257-9-5. This new standard can be used by independent testing laboratories to test pico-powered lighting products. In response to a growing market and an expressed desire from manufacturers, Lighting Global now accepts test results from independent laboratories that meet certain program requirements.

Manufacturers who wish to use independent labs to test products can have these results accepted by Lighting Global if the lab is ISO/IEC 17025 accredited to perform testing services in photometric, photovoltaic, and battery technologies. This Note will provide an overview of ISO/IEC 17025 accreditation as it applies to the Lighting Global program and IEC 62257-9-5<sup>1</sup>.

<sup>1</sup> See also the latest version of the **Lighting Global Product Testing Policy** document outlining specific instructions for laboratory testing and the implications of IEC 62257-9-5 for the Lighting Global program. The latest version of this policy document can be found on the Lighting Global website [www.lightingglobal.org](http://www.lightingglobal.org)

### ISO/IEC 17025<sup>2</sup>

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) are the organizational basis for many international technical standards. **ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories** establishes criteria for laboratories to gain accreditation to perform testing services. Accreditation is performed by a qualified accreditation body in the country where the lab resides. There are often several accreditation bodies in a host country that can accredit a lab.

The scope of a laboratory's accreditation can cover a specific test standard (such as IEC 62257-9-5) or it can cover a technology genre that includes a number of related test methods. Lighting laboratories may be accredited to perform photometric tests, for example, but not accredited to test solar modules. Lighting Global requires that a test lab be accredited to perform either IEC 62257-9-5 testing and/or industry standard test equivalents as discussed later in this Note.

ISO/IEC 17025 outlines several areas where a lab must demonstrate competence. The lab must have a proper management system in place, it must have appropriate personnel with the correct technical skills and experience, and it must have proper equipment to produce technically valid test results. ISO/IEC 17025 covers these topics in a general sense and outlines criteria for making these determinations. The accreditation body will perform an onsite assessment

<sup>2</sup> Laboratory Accreditation Bureau [www.l-a-b.com](http://www.l-a-b.com)

# Laboratory Testing Requirements and Accreditation

Issue 16 March 2014

to determine the competency of the laboratory to perform the requested test methods to be accredited (such as IEC 62257-9-5).

ISO/IEC 17025 is divided into two primary sections (**Clause 4: Management requirements** and **Clause 5: Technical requirements**). Within each section there are a number of subsections outlining important areas of competence for a lab seeking or maintaining accreditation:

## Management requirements

These requirements cover the management structure of the lab and outline the quality systems that must be in place for the organization of test procedures, documentation, and personnel. The management structure of the lab must allow for the identification of problems when performing test procedures, the process by which to correct these problems, and must also have in place a system to anticipate and pre-empt technical problems before they affect test results.

Documentation must be maintained and protected in such a way as to ensure not only the integrity of test results but also allow for internal audits. Audits and corrective actions for identified problems are given specific attention and are **a primary mechanism by which a lab will improve its performance** as it builds experience and technical expertise. Subcontracting of testing is also outlined as well as purchasing guidelines for materials used in tests.

## Management system requirements

The documentation requirements in ISO/IEC 17025 cover aspects of a lab's normal operation and have much in common with good business practice. Formal written procedures are required for many lab operations, including specific test procedures and equipment handling instructions. Other required procedures include the proper maintenance of personnel records and instructions on handling technical corrective actions that may arise as a result of inconsistent or improper test results.

## Technical requirements

**Personnel** – The lab must have technicians who understand the technology, have adequate training and demonstrate competency to perform required tests.

**Facilities** – The lab must have facilities that allow for the development of proper test environments. These include test rooms with proper environmental controls, controlled access of authorized personnel, proper storage facilities, and good housekeeping practices.

**Equipment** – The lab must have the necessary equipment in-house to perform the required tests or have adequate control of any externally supplied equipment. The equipment must be uniquely identifiable and capable of producing the required accuracy. It must be properly maintained, calibrated, and used only by authorized personnel.

**Technical Records** - Equipment used for testing must be properly documented and labeled. This includes visible calibration status labels, up-to-date calibration certificates, and written procedures for proper maintenance and handling.

## Estimation of uncertainty of measurement

One of the difficult requirements in ISO/IEC 17025 is the determination of measurement uncertainties (a measurement's confidence region). ISO/IEC 17025 requires that a lab estimate the uncertainty associated with test results and report those uncertainties when required. No test result is considered technically valid without an uncertainty estimate. Testing laboratories should contact Lighting Global to determine which tests require the reporting of uncertainties.

JCGM 100:2008 "Evaluation of measurement data – Guide to the expression of uncertainty in measurement" is an accepted international document available as a free download at [bipm.org](http://www.bipm.org)<sup>3</sup>.

<sup>3</sup> [http://www.bipm.org/utils/common/documents/jcgm/JCGM\\_100\\_2008\\_E.pdf](http://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf)

# Laboratory Testing Requirements and Accreditation

Issue 16 March 2014

For photometric testing, the US Department of Energy has published a Caliper exploratory study titled “Accounting for Uncertainty in Lumen Measurements” also available as a free download<sup>4</sup>.

## Measurement traceability

Measurement traceability is a major component of ISO/IEC 17025 and a key policy of all accreditation bodies. ISO/IEC 17025 requires traceability of measurements to the International System of Units (SI) with specific instructions on how this is achieved. All International Laboratory Accreditation Cooperation (ILAC) signatory accreditation bodies require traceability to the SI directly thru a National Metrological Institute (NMI) or through the use of 17025 accredited calibration labs. Establishing proper traceability can have a significant financial / time impact on the lab prior to accreditation.

## Sampling

The sampling procedures required by ISO/IEC 17025 are available from Lighting Global. All test product sampling must be coordinated through pre-approved agents according to guidelines that specify production batch sizes and handling instructions. Labs should contact Lighting Global to obtain these instructions.

## Proficiency Testing / Quality Assurance

Laboratories are required to perform quality assurance activities supporting their testing activities. These activities may include formal proficiency testing, inter-laboratory comparisons (round robin testing), or the use of testing of retained items.

Quality assurance is a priority and a focus for accreditation bodies. This is another area that can have significant financial and time repercussions for a lab prior to accreditation.

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<sup>4</sup> [http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper\\_exploratory\\_lumen-uncertainty.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/caliper_exploratory_lumen-uncertainty.pdf)

## **Accreditation**

Any accreditation body listed as an MRA signatory on the International Laboratory Accreditation Cooperation (ILAC) webpage<sup>5</sup> will be considered reputable by Lighting Global. For ISO 17025 accreditations obtained from accreditation bodies not listed on the ILAC webpage, manufacturers should contact the Lighting Global QA team to confirm if the ISO 17025 accreditation will be considered valid. The accreditation body will inform the applicant lab of the necessary requirements and work with the lab throughout the submission and assessment process.

Lighting Global requires the accreditation to be related to the types of test procedures that will be performed. An IEC 62257-9-5 accreditation covers the entire scope of testing in the Lighting Global program and is the preferred mechanism for a lab to become qualified to perform Quality Assurance testing, but accreditations in other test methods are also acceptable as outlined in **Table 1**. A lab need not have all accreditations, just those relevant to the type of testing the lab would like to perform.

## Benefits of Accreditation

Accreditation can be a powerful tool for improvement for laboratories seeking to establish and expand their testing capabilities. During the initial application and throughout the verification, assessment, and corrective actions processes, laboratories will gain detailed insight into the technical merits of their test results and learn how they can put in place systems to improve the quality and consistency of their testing. Accreditation does more than provide a document testifying to a lab’s ability to perform technical testing services. The process of obtaining and maintaining accreditation is a mechanism whereby a lab continually improves its technical ability and demonstrates competence through practice and delivery of technically valid results accepted worldwide.

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<sup>5</sup> [www.ilac.org](http://www.ilac.org)

# Laboratory Testing Requirements and Accreditation

Issue 16 March 2014

Table 1. Summary of technical accreditation requirements

Primary Accreditation Pathway	Alternate Accreditation Pathway
ISO 17025 accreditation to conduct tests according to the latest edition of IEC 62257-9-5	<ul style="list-style-type: none"><li>• ISO 17025 accreditation to conduct tests according to LM-79, or equivalent;*</li><li>• ISO 17025 accreditation to conduct tests according to IEC 61215 and IEC 61646, or equivalent;* <i>and</i></li><li>• Proof of staff experience and equipment capacity to successfully conduct battery tests and evaluations of electronic circuits as per the methods in IEC 62257-9-5.</li></ul>

**\*Note:** Test laboratories may submit documentation for what they consider to be an equivalent accreditation, but the final determination of whether a particular accreditation is satisfactory rests with the Lighting Global QA team.