



Approved Method: **IES Guide for the Selection,
Care, and Use of Electrical
Instruments in the
Photometric Laboratory**

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IES Guide for the Selection, Care
and Use of Electrical Instruments
in the Photometric Laboratory**

Publication of this Committee Report
has been approved by the IES.
Suggestions for revisions should be
directed to the IES

**Prepared by:
The Subcommittee on Photometry of Outdoor Luminaires
of the IES Testing Procedures Committee**

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**Prepared by the Subcommittee on Photometry of Outdoor
Luminaires of the IES Testing Procedures Committee**

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FOREWORD

IES LM-28-2012, is a revision of the 1989 report of the same name.¹ It has been revised primarily to acknowledge technological changes that have occurred in electrical measuring instrument design and interfacing. This guide defines the terms that are used to describe the instruments, and informs the reader about caution that must be taken when selecting, maintaining, and using electrical instruments in the photometric laboratory. Additionally, this guide will aid in the evaluation and application of electrical measuring instruments while maintaining appropriate levels of uncertainty.

1.0 TERMINOLOGY

The term *instrument* will be used throughout the guide instead of the term *meter*, which was incorrectly applied to ammeter, wattmeter, and similar types of instruments in previous publications of this document.

The instruments required for the photometric laboratory can be divided into two groups: (1) instruments for the measurement of electrical quantities in the testing of lamps and auxiliaries, and (2) special instruments and devices for such measurements as detector output, temperature, source color, total luminous flux, and luminaire and photometer angular position. Indicating and recording instruments may be used in either type of application.

2.0 GENERAL CONSIDERATIONS

2.1 Digital versus Analog Instruments.

Digital instruments are widely used in the lighting industry. Digital instruments are often preferred over analog instruments because of their accuracy, precision, cost effectiveness, ease of use, and superior stability. High quality analog instruments can also be viable choices for the measurement of voltage, current, power, and temperature when properly used. **Annex A** provides information regarding the selection and precautions involved with the use of analog instruments.

2.2 Single-Range versus Multi-Range Instruments.

Instruments may be single-range or multi-range. Most digital instruments that are currently available

are of the multi-range type. If appropriately used, single-range instruments are equally viable tools in the photometric laboratory.

Most multi-range digital instruments are designed to automatically select the most appropriate range for the values being measured. Regardless of the type of instrument being used, care must be taken to ensure that the readings are in the upper portion of the scale of the instrument. To highlight the necessity of proper range selection, consider the following example:

- 1) If a dc ammeter on a ten-ampere range is specified by the manufacturer to be accurate within one-half percent of full scale, one-half percent of ten amperes is 0.05 amperes.
- 2) If the measured current is read as five amperes, 0.05 ampere represents one percent of the measured value.
- 3) If the measured current is read as one ampere, 0.05 ampere represents five percent of the measured value.

2.3 Calibration.

Instruments used in the photometric laboratory shall be maintained according to an appropriate calibration schedule. The manufacturer's recommended calibration schedule should be followed unless the laboratory's assessment of the instrument's stability and the required uncertainty for the measurement indicates a revised schedule.

3.0 INSTRUMENTS FOR MEASUREMENT OF ELECTRICAL QUANTITIES

3.1 General.

Since modern lamp and ballast designs might produce non-sinusoidal wave shapes, alternating current (ac) instruments that measure root-mean-square (rms) values are necessary. Care must be taken when selecting rms measuring equipment. Not all instruments referred to as "rms measuring instruments" accurately measure rms values. Some instruments utilize a mathematical approach that assumes the waveform that is being measured is a perfect sine wave. This will lead to significant error when measuring wave shapes that differ from a pure sine wave. In addition, non-sinusoidal wave shapes can contain harmonic components that occur at high frequencies. In order to properly measure the contribution of these high frequencies, it will be necessary