



**ACCREDITATION SCHEME FOR LABORATORIES**

**Technical Notes EL 001**  
**General Requirements for Electrical**  
**Testing Laboratories**

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## 1. Introduction

1.1 The field of Electrical Testing covers a wide range of tests and is divided into the following broad areas:

- Appliances  
A consuming device, other than a lamp, in which electricity is converted into heat, motion, or any other form of energy, or is substantially changed in its electrical character
- Luminaire  
Apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes all the parts necessary for supporting, fixing and protecting the lamps, but not the lamp themselves, and where necessary circuit auxiliaries together with the means for connecting them to the supply
- Conduit & Trunking System  
A wiring system consisting of conduit/trunking fittings for the protection and management of insulated conductors and/or cables in electrical or communication installations
- Accessory  
A device other than current-using equipment, associated with such equipment or with the wiring of an installation
- Equipment  
An equipment for such purpose as generation, conversion, transmission or distribution protection, such as generator, transformer, switchgear, protective devices etc
- Electronic Components  
Any of the parts that make up or needed for a whole especially for an electronic system. E.g capacitor, resistor or electronic devices etc
- Electromagnetic Compatibility  
The ability of an electronic system to function properly in its intended electromagnetic environment and not to be a source of pollution to that environment
- Environmental Reliability  
Environmental simulation with temperature cycling or vibration stress to determine the types of failure under these environmental stresses

- 1.2 These guidelines should be read in conjunction with documents SAC 01 “Terms and Conditions for Accreditation”, SAC-SINGLAS 002 “Requirements for the Application of ISO/IEC 17025” and Proficiency Testing Technical Note 001 “Policies on Proficiency Testing”.
- 1.3 Supplementary information for specific areas of testing within the Electrical Testing field may be published as other Technical Notes.

## **2. Accommodation and Testing Environment**

### **2.1 Construction of testing laboratories**

- (a) Adequate space to house workbenches, ancillary apparatus and instrument and enclosed storage space for working equipment
- (b) Adequate space for the required number of test operators and supervisory staff. Evacuation corridor should be clearly marked for emergency exit.
- (c) The walls, floor and ceiling should be constructed to minimise the effects of external noise, vibration and electromagnetic interference, if relevant.
- (d) Proper shielding should be erected to ensure testing is not affected by the stray magnetic field. Water pipes in the wall, floor or ceiling are a potential source of stray fields. It may be necessary to electrically isolate the pipes and ground them to the laboratory earth. Electrical supply cables, particularly those supplying other parts of the building or site, should be enclosed in steel ductwork which should not be earthed to the laboratory earth.
- (e) Proximity to plant rooms and heavy equipment workshop should be avoided. Acoustic noise may be reduced using double glazing windows.
- (f) The laboratory floor should have an antistatic covering particularly when high-resistance circuits and instruments are to be used.
- (g) For testing of equipment at high voltage, it shall be carried out in a room or enclosed area which are provided with adequate safety protection (e.g. a rubber mat or inter-locking device etc).
- (h) For testing of materials at high temperature, it shall be carried out in properly constructed test chamber provided with adequate exhaust to disperse the combustible waste e.g. toxic gases and the elimination of pungent odours etc.

## 2.2 Air conditioning and ventilation

- The air exchange rate should be adequate to cope with altering temperature conditionings. The incoming air should be filtered to minimise dust and heat intake.
- The ambient condition should be maintained at a temperature according to the test condition required for the purpose of preventing condensation.

In addition, unless the test equipment and items under test have short thermal time constants, a considerable part of the working day will be lost waiting for the test system to reach thermal equilibrium.

## 2.3 Lighting

Workbench should be adequately illuminated and the illuminance should preferably be in the range of 400 to 500 lux.

## 2.4 Electrical Supply

- The electric power to the air conditioning unit, the workbench and room lighting should be supplied from an independent circuit which is separated from the supply to other factory or office.
- Power from general purpose outlets at the workbench should be controlled via a line conditioner or voltage stabilizer. An earthing bus common to all benches should be provided to earth each piece of electrical instrument or apparatus as required.

## **3. Calibration Intervals for Electrical Testing Equipment**

3.1 Annex 1 sets out nominal recommended maximum periods between successive calibrations for a number of measuring instruments. It must be stressed that these periods are generally considered to be the recommended maxima appropriate in each case providing that:

- (a) the equipment is of good quality and of proven adequate stability, and
- (b) the laboratory has both the equipment capability and staff expertise to perform adequate internal checks, and

(c) if any suspicion or indication of overloading or mishandling arises, the equipment will be checked immediately and thereafter at frequent intervals until it can be shown that stability has not been impaired.

Where the above criteria cannot be met, appropriate shorter intervals will be specified.

- 3.2 Submission for extension of calibration interval based on factors such as history of stability, frequency of use, accuracy required and ability of staff to perform regular checks may be considered. It is the responsibility of the accredited testing laboratories to provide evidence that its calibration system ensures that confidence in the equipment can be maintained.
- 3.3 When calibrations have been performed by the staff of a laboratory, proper records of measurement must be documented and maintained.

#### **4. Approved Signatories for Emerging Area**

- 4.1 The nominee for approved signatory for emerging area shall have related industry experience and be with the organisation for at least 1 year, trained and assessed by experts in the emerging field (e.g. overseas founder).
- 4.2 All other requirement specified in clause 5 of SAC-SINGLAS 001 shall apply.

## Annex 1

| <b>Types of equipment</b>                             | <b>Recommended maximum period between successive calibrations</b>   |
|---|---|
| Attenuators   | 3 years (frequency response)<br>Where appropriate conduct annual check on resistance and return loss values |
| Bridges   | 3 years (full calibration)<br>Range check annually  |
| Capacitors  | 3 years<br>Intercompare annually  |
| Digital meters  | 1 year  |
| Digital calibrators with self checking                | 2 years   |
| Inductors   | 3 years<br>Intercompare annually  |
| Instruments, indicating and recording (analogue only) | 3 years<br>Intercompare every 6 months or more frequently as required                                       |
| Instrument and ratio transformers                     | 5 years   |
| Instrument transformer test sets                      | 3 years (full calibration)<br>Annual intercomparison of transformers to detect major problems               |
| Potentiometers  | 2 years   |
| Resistors   | 3 years<br>Intercompare annually  |
| RF noise sources                                      | 2 years   |
| RF power measuring equipment                          | 2 years<br>Annual check VSWR  |
| Signal generators                                     | 1 year  |
| Volt ratio boxes                                      | 3 years<br>Intercompare annually  |

| <b>Types of equipment</b>                 | <b>Recommended maximum period between successive calibrations</b>   |
|---|---|
| Wathour meters(Electro-mechanical)        | 1 year<br>Intercompare every three months   |
| Wattmeters and Wathour meters(Electronic) | 1 year with regular intercomparison. Intervals to be based on history of performance  |
| Standard cells and electronic references  | 2 years<br>Intercompare at least six monthly  |
| Time and frequency standards              | Calibration interval dependent on equipment frequency type and accuracy required. This may be as frequently as daily if the highest possible performance is required. |
| Transfer standards, AC-DC                 | 5 years with annual self-check for a stand-alone instrument. 8 years with annual self-check and 4-yearly intercomparison  |
| <b>Ancillary Equipment</b>                |   |
| Accelerometers                            | 1 year  |
| Anemometers                               | 2 years   |
| Environmental chambers                    | 1 year  |
| Force testing machines                    | 2 years   |
| Hygrometers                               | Assman hygrometers and sling - 5 years<br>Recorders accurate to +/- 1% RH - 2 years<br>Other recorders including hair type - 1 year                                   |
| Mass                                      | Reference - 3 years<br>Working - 1 year   |
| Micrometers, dial gauges, caliper, etc    | 1 year  |
| Pressure and vacuum gauges                | 1 year  |
| Thermocouples                             | a) Rare metal - 100 hrs use or 3 years<br>b) Base metal - Calibration interval to suit the particular application   |
| Weighing appliances                       | 1 year  |

| <b>Types of equipment</b>  | <b>Recommended maximum period between successive calibrations</b>   |
|--|---|
| Thermometers   | <p><b>Liquid-in-glass(reference thermometer)</b><br/> Check ice point or other suitable reference point each time used or at intervals of 1 to 2 months, whichever is the sooner until the secular change is less than half the uncertainty of calibration. Then check every 6 months. Recalibrate every 5 years when reference point changes by 5 or more scale divisions.</p> <p><b>Liquid-in-glass(working thermometer)</b><br/> As working thermometer intercompare with reference thermometer at two points in the working range every 6 months. Recalibrate every 5 years or when a change of 5 or more scale divisions is noted.</p> <p><b>Resistance-temperature thermometer</b><br/> Check ice point before use or at least every 6 months. Recalibrate every 5 years or when ice point changes by detector more than the equivalent of five times the uncertainty of calibration.</p> |
| <b>EMC and Electrical Safety Testing Equipment</b><br><br>Absorbing Clamps<br><br>Antennae<br><br>Attenuators, cables, couplers and preamplifiers<br><br>Harmonic and voltage fluctuation measuring equipment<br><br>Immunity Field strength meters<br><br>Impact hammers<br><br>Impulse testers<br>ESD testers<br><br>Receivers<br><br>Surge generators | Annual check<br><br>3 years<br><br>Annual check<br><br>Annual calibration<br><br>3 years<br><br>5 years<br><br>Annual check<br><br>Annual calibration<br><br>Annual check   |



| <b>Types of equipment</b>  | <b>Recommended maximum period between successive calibrations</b> |
|--|---|
| <b>Solar Testing Equipment</b>                                     |   |
| DC current shunt<br>Resistor box (1M, 10M,<br>100M, 500M, 1G ohms) | Annual calibration  |
| IV curve tracer  | Annual calibration  |
| Mechanical load test stand   | Annual calibration  |
| Multi-channel Hipot tester   | Annual calibration  |
| Luxmeter   | Annual calibration  |
| Pyranometer  | Annual calibration  |
| World PV Scale (WPVS)<br>reference cell                            | Annual calibration  |
| Reference cell   | Annual calibration  |
| Sensor UVA   | Annual calibration  |
| Sensor UVB   | Annual calibration  |
| Sun simulator module   | Annual calibration  |
| Solar simulator wavelength<br>filters                              | Annual calibration  |
| Weather multi-sensor   | Annual calibration  |
| Torque screwdriver   | Annual calibration  |
| Hail tester stand inclusive<br>ice projectile making<br>unit/mold  | Annual calibration  |