



Jordanian Accreditation System  
نظام الاعتماد الأردني  
**Accreditation Unit**

## ACCREDITATION UNIT

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### **POLICY ON MEASUREMENT TRACEABILITY**

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***Purpose***

To explain the concept of measurement traceability, the methodology achievement and demonstration.

***Scope***

This policy is intended to explain the acceptable sources of measurement traceability, how it can be achieved, and how it can be demonstrated. The Accreditation Unit (AU) requirements pertaining to measurement traceability are described in compliance with ILAC-P10. This document shall be implemented by all AU accredited and applying for accreditation calibration and testing laboratories. AU assessors are also responsible for assuring the implementation of this policy.

***Authorship***

This publication has been written by the Technical Committee, and approved by the Accreditation Director.

***Official language***

The text may be translated into other languages as required. The English language version remains the definitive version.

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## 1. Introduction

The quality of products and services is becoming increasingly dependent on reliable measurements. The importance attached to measurements is reflected in relevant standards (ISO/IEC 17025, ISO 15189) by the requirement that measurements must be “traceable” to national or international standards of measurements.

## 2. Terminology: Calibration, Testing and Traceability

The definitions below apply in addition to JCGM 200:2012 "International vocabulary of metrology – Basic and general concepts and associated terms (VIM) 3rd edition".

### 2.1 Calibration

Calibration is defined as the “set of operations which establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure, or a reference material, and the corresponding values realized by standards”.

In general, “calibration” means determining and documenting the deviation of the indication of a measuring instrument (or the stated value of a material measure) from the conventional “true” value of the measured.

A proper calibration result should include: the measured value, Reference value, a stated uncertainty, identification of the standards used in the calibration and the specification of any environmental conditions of the calibration where correction factors should be applied, if the standard or equipment were to be used under different environmental conditions

### 2.2 Testing

A test is defined as “a technical operation that consists of the determination of one or more characteristics of a given product, process or service according to a specified procedure.”

### 2.3 Traceability:

- Metrological traceability (VIM 3 clause 2.41)

Property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty.

In ISO/IEC 17025 and ISO 15189 the term “traceability” is equivalent to the VIM’s “Metrological traceability” and the term “traceability” is used throughout this document.

- Metrological traceability chain (VIM 3 clause 2.42)

Sequence of measurement standards and calibrations that is used to relate a measurement result to a reference.

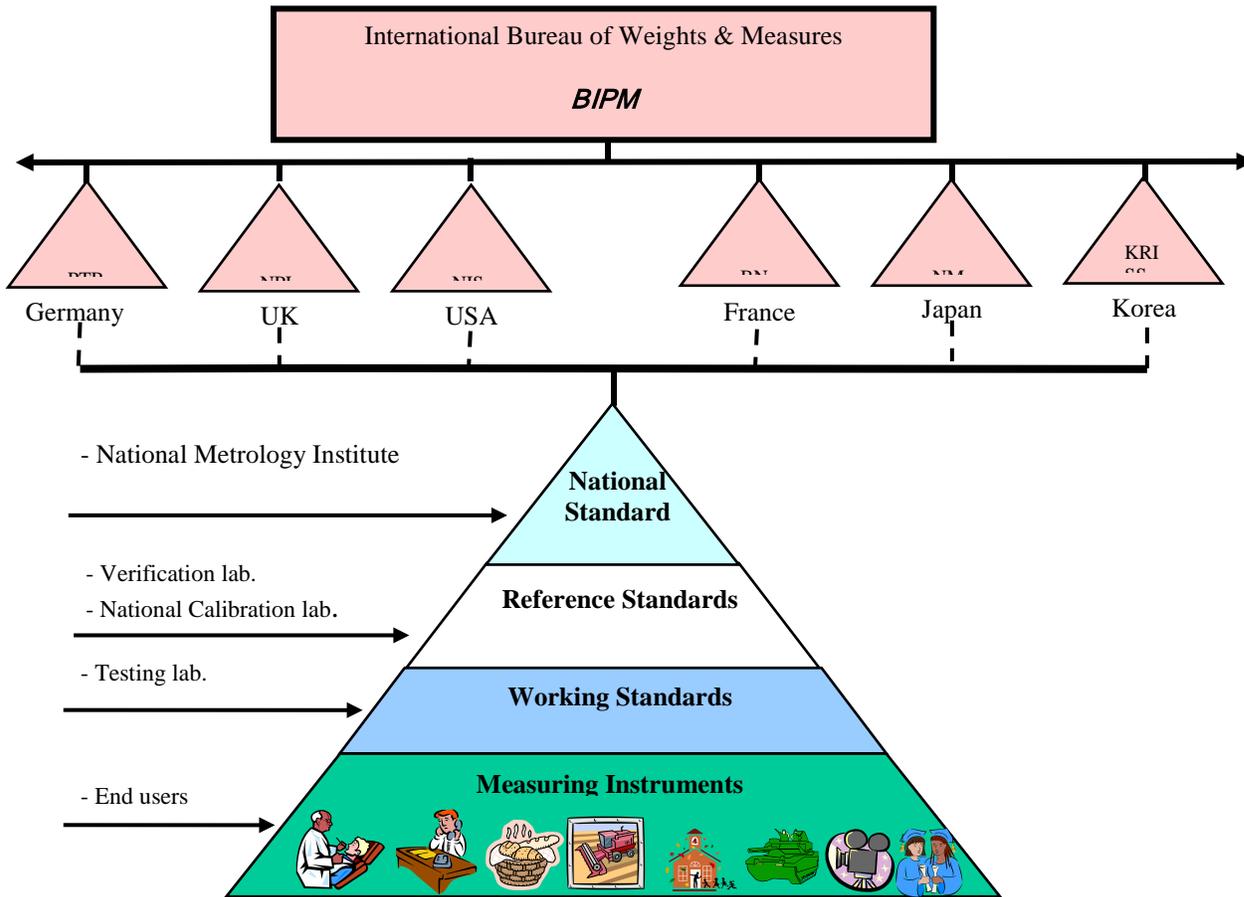
- Metrological traceability to a measurement unit (VIM 3 clause 2.43)

Metrological traceability where the reference is the definition of a measurement unit through its practical realization

\* The expression “traceability to the SI” means metrological traceability to a measurement unit of the International System of Units.

2.4 JNMI:

Jordan National Metrology Institute, which maintains the national measurement standards in Jordan. This traceability chart shows the position of JNMI with respect to BIPM.



2.5 JCGM 2000:2012: Joint Committee for Guides in Metrology, chaired by the Director of the BIPM, was formed by the seven International Organizations that had prepared the original versions of the Guide to the expression of uncertainty in measurement (GUM) and the International vocabulary of basic and general terms in metrology (VIM).

2.6 BIPM: International Bureau of Weights and Measures

2.7 KCDB: Key Comparison Data Base /BIPM.

2.8 JCTLM: Joint Committee for Traceability in Laboratory Medicine

### **3. Characterization of Traceability**

Traceability is characterized by six essential elements:

#### 3.1 An unbroken chain of comparison:

Traceability begins with an unbroken chain of comparisons originating at national, international or intrinsic standards of measurement and ending with the working reference standards of a given metrology laboratory.

#### 3.2 Measurement uncertainty:

The measurement uncertainty for each step in the traceability chain must be calculated according to defined methods and must be stated at each step of the chain so that an overall uncertainty for the whole chain can be calculated.

#### 3.3 Documentation:

Each step in the chain must be performed according to documented and generally acknowledged procedures and the results must be documented, i.e., in a calibration or test report.

#### 3.4 Competence:

The laboratories or bodies performing one or more steps in the chain must supply evidence of technical competence, e.g., by demonstrating that they are accredited by an internationally recognized accreditation body.

#### 3.5 Reference to SI Units:

Where possible, the primary national, international or intrinsic standards must be primary standards for realization of the SI units.

#### 3.6 Recalibrations:

Calibrations must be repeated at appropriate intervals in such a manner that traceability of the standard is preserved.

## 4. Sources of Traceability

4.1 AU requires that all calibrations of measuring and test equipment, reference standards, and reference materials are conducted and traceable to :

- a- An NMI whose service is suitable for the intended need and is covered by the CIPM MRA. Services covered by the CIPM MRA can be viewed in Appendix C of the BIPM KCDB which includes the range and uncertainty for each listed service. Or,
- b- An accredited calibration laboratory whose service is suitable for the intended need (i.e., the scope of accreditation specifically covers the appropriate calibration) and the Accreditation Body is covered by the ILAC Arrangement or by Regional Arrangements recognized by ILAC.
- c- Any national calibration laboratory recognized by the national authorities (Jordan Standards and Metrology Organization JSMO) as the holder of national reference standards subject that this laboratory is accredited or competent according to ISO/IEC 17025 (see annex 2). JSMO is responsible for ensuring the traceability of measurements in Jordan. Assessor can verify this recognition by contacting AU or JSMO; or,
- d- A calibration laboratory whose service is suitable for the intended need but not covered by the ILAC Arrangement or by Regional Arrangements recognized by ILAC. in this case the compliance of the calibration lab to the requirements of ISO/IEC 17025:2005, shall be verified by fulfillment of the requirements in annex 2.

CABs that have demonstrated traceability of their measurements through the use of calibration services offered according to a) or b) above have made use of services that have been subject to relevant peer review or accreditation. In the situation where c) or d) applies, this is not the case, so these routes should only be applicable when a) or b) are not possible for a particular calibration. The laboratory must therefore ensure that appropriate evidence for claimed traceability and measurement uncertainty is available and the accreditation body shall assess this evidence.

Accepted calibration laboratories are accredited by AU or an internationally recognized accreditation body that is a signatory to EA/ILAC MRA, or calibration laboratories which are signatory to CIPM MRA. Calibration certificates or reports must hold the logo of its accreditation body or otherwise makes reference to accredited status (i.e. through use of a statement that the laboratory is accredited by XYZ via certificate number xxxx.yy) in order to verify its accreditation status. All calibration

certificates should provide a statement of uncertainty in addition to the statement of compliance, if appropriate. In case the logo does not appear on the calibration certificate, then the certificate cannot be accepted, unless the laboratory fulfills the requirements stated in annex 2.

4.2 If a calibration is not a dominant factor in the testing result, the laboratory shall have quantitative evidence to demonstrate that the associated contribution of a calibration contributes little (insignificantly) to the measurement result and the measurement uncertainty of the test and therefore traceability does not need to be demonstrated.

4.3 Where traceability to SI units is not technically possible, traceability can be to certified reference materials or consensus standards agreed by AU and by the lab and following AU related technical policies. Labs shall keep all related evidences such as the calibration procedure followed, before and after calibration data, competence of staff, validation of results, related environmental conditions and measurement uncertainty procedure and results.

In case of using RM or CRM, the laboratory shall demonstrate that each RM or CRM is suitable for its intended use as required in ISO/IEC 17025 or ISO 15189.

4.4 The values assigned to CRMs produced by NMIs and included in the BIPM KCDB or produced by an accredited RMP under its accredited scope of accreditation to ISO Guide 34:2009, are considered to have established valid traceability.

4.5 The values assigned to CRMs covered by entries in the JCTLM database are considered to have established valid traceability.

4.6 The majority of RMs and CRMs are produced by other RMPs. These can be considered as critical consumables and the laboratory shall demonstrate that each RM or CRM is suitable for its intended use as required by ISO/IEC 17025 and ISO 15189.

4.7 All laboratories must define and document their policy for achieving measurement traceability and it shall be in compliance with this policy.

Note1: Further information on the evaluation of sources of traceability are provided in Annex 1.

Note 2: Detailed guidance on traceability requirements for certain specific technical fields will be made available soon.

## 5. Scopes of Accreditation

Scopes of accreditation are documents that define specifically the measurements a laboratory is accredited to make. In addition, the scope defines the ranges of the accredited measurand along with the associated calibration and measurement capability expressed as an expanded uncertainty for each measurand and range; also the coverage factor should be stated

Accreditation is generally given for specified measurands and for the smallest uncertainties that can be achieved with the suitable measuring devices available in the respective calibration laboratory (calibration and Measurement Capability).

Before placing work with an accredited laboratory, it is important that the customer request a copy of the laboratory's scope of accreditation in addition to the accreditation certificate so that the customer can ensure that the laboratory is accredited to perform the needed measurements. In addition, customers must ensure that the laboratory's measurement uncertainties are suitable for their needs.

## 6. Accredited Calibration certificates & Reports and Statements of Traceability

Calibration Certificates or reports must contain a traceability statement to national or international standards of measurement and should provide the measurement result and associated uncertainty of measurement. This statement will affirm that the calibration was conducted using standards whose values are traceable to an appropriate national, international, intrinsic, or mutual consent standard.

## 7. Determination & Statement of Uncertainty

Refer to AU Policy for Estimation of Measurements Uncertainty and its Implementation (JAS-P03).

## 8. References

- International vocabulary of metrology – Basic and general concepts and associated terms (VIM) 3rd edition, JCGM 200:2012 (JCGM 200:20008 with minor corrections).
- ISO/IEC17025:2005; General Requirements for the competence of testing and calibration laboratories.
- ISO 15189:2012, Medical laboratories — Requirements for quality and competence.

- AU Policy for Estimation of Measurements Uncertainty and its Implementation (JAS-P03)
- **AU Policy on In-House Calibration (JAS-P21)**
- A2LA Policy on Measurement Traceability, May 2013.
- EAL-G12: Traceability of measuring and test equipment to national standards.
- DAR-4-EM-03: Guideline for Traceability in Testing.
- Accreditation Criteria for Testing Laboratories (AC89) 2010 - International Accreditation Services, INC. – USA
- ILAC P10:01/2013 ILAC POLICY ON THE TRACEABILITY OF MEASUREMENT RESULTS

## Annex 1

### Evaluation of Sources of Traceability

#### **☒ Acceptable Accreditation bodies of Calibration & Testing laboratories**

Accredited test and calibration results, reported by laboratories that are accredited by an accreditation body that has signed a MLA with ILAC/EA, and stated in a test or calibration report endorsed by the accrediting body's logo, or which otherwise makes reference to accredited status (i.e. through use of a statement that the laboratory is accredited by XYZ via certificate number xxxx.yy), are recognized by AU as satisfying the requirements pertaining to measurement traceability.

The list of ILAC MRA signatories can be viewed at:

<http://ilac.org/membersbycategory.html>.

The list of EA signatories can be viewed at:

<http://www.european-accreditation.org/mla-and-bla-signatories>

Assessors during the onsite assessment will review the related calibration certificates or reports and will evaluate the fulfillment of the requirements of this policy.

#### **☒ National Metrology Institutes and Signatories to CIPM MRA**

National Measurement Institutes (NMIs) and intergovernmental and international organizations that participate in the CIPM/BIPM Mutual Recognition Arrangement MRA are accepted.

Acceptability is limited to the uncertainty levels published in the CIPM calibration measurement capability (CMC) tables that comprise an integral part of the MRA and can be viewed at [www.bipm.org](http://www.bipm.org).

## Annex 2

### **Considerations when traceability is not established through An Accredited Laboratory, or out of the scope of calibration.**

When traceability is established through a laboratory that is recognized by the national authorities (Jordan Standards and Metrology Organization JSMO), or by a laboratory that is not accredited, in this case the laboratory shall provide Appropriate evidence for the technical competence of the laboratory and claimed metrological traceability is likely to include but not be restricted to the following:- (numbers refer to clauses in ISO/IEC17025:2005):

1. Records of calibration method validation (5.4.5).
2. Procedures for estimation of uncertainty (5.4.6).
3. Documentation for traceability of measurements (5.6).
4. Documentation for assuring the quality of calibration results (5.9).
5. Documentation for competence of staff (5.2).
6. Documentation for accommodation and environmental conditions (5.3).
7. Audits of the calibration laboratory (4.6.4 and 4.14).
8. Reporting the results (5.10).

It's responsibility of AU to perform a practical assessment of the laboratory used, similar to that which would be undertaken by an Accreditation Body against the standard ISO/IEC 17025, to ensure that competent work is actually being performed.