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KENYA
ACCREDITATION
SERVICE

ACC-CD-09-01

Criteria For Accreditation of Pressure Metrology

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1 Background Information

1.1 Purpose

The purpose of this document is to define the specific environmental, general and technical requirements to be met by laboratories to be accredited in the field of pressure calibration.

1.2 Scope

This document covers the application of the ISO/ IEC 17025 for accreditation of Pressure laboratories. This document should be read in conjunction with the Rules and Procedures of KENAS.

2 Glossary

2.1 Acronyms and Abbreviations

CEO	Chief Executive Officer
CMLAB	Chief Manager Laboratories Directorate
KEBS	Kenya Bureau of Standards
NMI	National Metrology Institute
NSB	National Standards Body
OIML	International Organization of Legal Metrology.
ISO	International organization for standardization.
CMC	Calibration and Measurement Capability
KENAS	Kenya Accreditation Service
ISO	International Organization for Standardization
IEC	International Electrotechnical Commission

2.2 Terms and Definitions

2.2.1 Accreditation

A third-party attestation related to a conformity assessment body conveying formal demonstration of its competence to carry out specific conformity assessment tasks.

2.2.2 Committee

A group of people appointed for a specific function by a larger group or organization.

2.2.3 Absolute pressure

An absolute pressure measurement is referenced to zero pressure.

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2.2.4 Atmospheric Pressure

Also called barometric pressure, it is the weight of the atmosphere on a unit surface.

2.2.5 Gauge Pressure

A gauge pressure measurement is referenced to atmospheric pressure. It will vary with barometric pressure.

2.2.6 Vacuum

Any pressure below atmospheric. When this measurement is referenced to atmospheric pressure (a negative gauge measurement), it is called a vacuum pressure. However, when it is referenced to zero pressure it is an absolute pressure measurement.

2.2.7 Calibration

Specific types of measurement performed on measuring instruments to establish the relationship between the indicated values and known values of a measured quantity.

2.2.8 Repeatability

A measure of a weighing machine's ability to display the same result when repeated measurements are made under the same weighing conditions.

2.2.9 Uncertainty

The amount by which a true value may differ from a measured value, at a given confidence level.

3 Roles and Responsibilities

Role	Responsibility
All KENAS Technical Staff	Process Owner
SCBO	Reviewer
CMIV	Recommender
CEO	Approval
Accreditation Committee	Compliance

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4 Process Detail

4.1 Personnel Requirements

4.1.1 The calibration laboratory shall engage staff possessing the technical and professional expertise necessary to perform the calibration. The staff may be full-time, part-time or contracted personnel. The personnel performing the calibration shall satisfy all the requirements defined in clause **6.2 of ISO/IEC 17025:2017**.

4.1.2 KENAS accredited and applicant laboratories are required to provide training to their calibration technicians and to their authorized signatories to comply with the requirements of **ISO/IEC 17025:2017**. The calibration laboratory shall evaluate and appraise the calibration technicians to be competent before allowing them to perform calibration work independently.

4.2 Environmental and Accommodation Requirements

4.2.1 To be deemed capable of making adequate measurements, calibration laboratories shall provide an environment with adequate environmental controls appropriate for the level of measurements to be made as required by clause 6.3 of **ISO/IEC 17025:2017.**

4.2.2 Temperature: The temperature in any laboratory where pressure or vacuum calibration is conducted must be maintained at 22 °C ± 3 °C however no temperature control is necessary when uncertainties of larger than ± 0,25 % are needed. Laboratories quoting uncertainties of equal to or less than ± 0,10 % shall ensure that temperature gradients within the laboratory are limited to less than 1ºC per hour.

4.2.3 Lighting within the laboratory shall be adequate to facilitate the correct performance of the calibration work undertaken. Cognizance shall be taken of the minimum levels of lighting as specified in **clause 50 of the Occupational, health and Safety bill (OSHA Act 2007).**

4.2.4 Housekeeping: Calibration laboratory shall have adequate space, be free from dust and fumes, free from vibration and acoustic noise and free from any contamination especially in locations where calibration items are calibrated.

4.2.5 The extent to which these environmental factors apply will vary according to the uncertainty to which calibrations are performed.

4.2.6 Where necessary the laboratory shall maintain appropriate records to demonstrate and confirm the environmental conditions within the laboratory.

4.3 Safety Requirements

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4.3.1 All Metrology and Calibration laboratories are expected to comply with the Occupational Safety, health Act 2007 and any other health and safety requirements which shall apply.

4.4 General Requirements

4.4.1 Calibration of a pressure gauge in the laboratory must take place on a work bench of adequate construction, which will facilitate the stable and correct operation of the gauge. The work bench design shall take cognizance of vibration, stability, and support.

4.4.2 Laboratories shall have a policy and procedure/s that addresses how pressure equipment, both their own references and equipment belonging to its customers are to be handled, cleaned and refurbished.

4.4.3 Any material, cloths or other equipment used for the handling of pressure equipment shall be kept clean. The pressure equipment shall be stored in a clean, safe and secured environment.

4.4.4 Where the laboratory uses or calibrates mercury manometers, or barometers, the laboratory shall have a MSDS available that shall include all the details of the necessary action to be taken in the event of a mercury spill.

4.4.5 Laboratory procedures shall address the use of various types of tubing used to interconnect equipment during calibration. Particular attention shall be paid to the applicable maximum pressure rating of the tubing used.

4.4.6 Laboratory procedures shall address temperature stabilization times for all equipment received by the laboratory for calibration. Where appropriate localized temperature measurement shall be performed and the temperature recorded during calibration, e.g. for Piston Cylinder units or Mercury columns.

4.4.7 Raw data shall be recorded in a non-erasable ink.

4.5 Technical Requirements

4.5.1 Reference standards used for the Calibration of Pressure equipment

4.5.2 Traceability of a measurement result is ensured when the result can be related to a stated reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty. The stated reference at the end of the chain is expected to be one or more CMCs held by national metrology institutes (NMIs) and based on practical realizations of the International System of Units.

4.5.3 Calibrations recognized by KENAS as traceable to national standards shall be evidenced by appropriate calibration certificates, and can be provided:

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i. By the National Metrology Institute or the National Standards Laboratory of another country that is covered by a mutual recognition agreement under ILAC or,

ii. By a KENAS accredited calibration laboratory or,

iii. By an accredited calibration laboratory accredited by an overseas body that is party to the international multilateral agreements for accreditation bodies or,

iv. In-house using documented procedures that have been assessed as appropriate by KENAS. This might be through the use of reference standard owned by the laboratory, or through the use of a suitable calibrated pressure gauge. The reference standard pressure gauges should be in a current state of calibration in accordance with (a), (b) or (c) above.

4.6 Local Gravity

4.6.1 Whenever a pressure or vacuum calibration laboratory calibrates or uses a pressure balance or liquid column manometer in the laboratory, the laboratory shall have had determined, or calculated, the local gravity at the location of the laboratory.

4.7 Equipment Set up

4.7.1 The equipment shall be switched on in the calibration laboratory before starting the calibration in order to reach the thermal equilibrium of the whole system.

4.7.2 Equipment shall be protected from direct sunlight and shall be cleaned.

4.7.3 Equipment to be calibrated shall be placed as close as possible to the reference standard.

4.7.4 Pressure reference levels of both the equipment, shall be ensured to be as close as possible and any difference in the pressure reference level shall be accounted when calculating corrections and uncertainties.

4.7.5 Any manufacturer’s specification on the equipment shall be respected e.g. mounting position, torque, warm-up etc.

4.8 Calibration Methods

4.8.1 If appropriate, the procedure of calibration shall allow according to the client's requirement the evaluation of the hysteresis, the linearity and the repeatability of the instrument to be calibrated.

4.8.2 The applied procedure shall depend on the expected accuracy of the equipment according to the client's requirement.

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4.8.3 The equipment shall be calibrated as a whole (measuring chain), if possible. The specified mounting position shall be taken into consideration.

4.8.4 The calibration shall be carried out in measurement points uniformly distributed over the calibration range. Calibration shall be done at different pressure points in increasing and decreasing pressures.

4.8.5 Repeatability shall be estimated at several repeated measurements at one pressure point.

4.9 Uncertainty of measurement:

4.9.1 The calibration laboratory shall perform a measurement or series of measurements on equipment using the same calibration method, apparatus, and personnel. The laboratory shall be able to identify and quantify all sources of uncertainty that affect the measurement. The laboratory shall attach an overall uncertainty to the measurement by combining all uncertainty contributions, in their type A and type B components, in the root-sum-squared method.

4.9.2 The Laboratories shall supply (and have available) for evaluation all relevant data of the equipment, such as specification sheets, used in the determination of the CMC, along with copies of the Uncertainty of Measurement estimation. All relevant factors shall be considered, and only after confirmation that the contribution is insignificant may they be omitted from the estimation. This process shall be documented.

4.10 Calibration and check intervals

4.10.1 The frequency of calibration shall depend on the type of equipment and its use. The equipment shall be calibrated fully at a certain interval as determined by the client, statutory regulations method requirement or when found necessary.

4.10.2 Regular checks (intermediate checks) may be required between full calibrations, dependent upon use and intervals between full calibrations.

4.10.3 Full calibrations shall be performed after a significant change in the laboratory's environmental conditions, or following service or repairs carried out on the equipment. (Whether carried out by the user or by a service agent). Intermediate checks, or full calibrations, shall also be performed when there is any reason to believe that any other change has occurred which may affect the accuracy of the equipment, or where servicing is planned that can be expected to adjust its characteristics.

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5 Associated Documents

Ref	Document Identifier	Document Title
1.	ACC-02	Accreditation Manual
2.	ISO/IEC 17011	Conformity Assessment-General requirements for accreditation bodies accrediting conformity assessment bodies
3.	ISO/IEC 17025	Conformity Assessment – General requirements for Testing and Calibration Laboratories
4.	ACC-FM-28-01	Confidentiality Form
5.	PL-36-01	KENAS Policy on traceability of measurements
6.	KS 09-731:1985	Specification for Bourdon tube pressure and vacuum gauges.
7.	OSHA ACT 2007	Occupational Safety and Health Act: 2007
8.	KS 09:731:1985 Cl. 1.1.3	Using Manometers to Precisely Measure Pressure, Flow and Level – Meriam Instrument.

6 Revision/Amendment Records

Date	Version	Revised by	Reason for Revision
10/10/2022	01	RSQ	Newly developed/formatted document

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