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Kenya Power

UNIVERSAL TESTING MACHINE

— SPECIFICATION

A Document of the Kenya Power & Lighting Co. Ltd

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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Manager, Standards
Electronic copy (pdf) on Kenya Power server (http://172.16.1.40/dms/browse.php?fFolderId=23)	

REVISION OF KPLC STANDARDS

In order to keep abreast of progress in the industry, KPLC standards shall be regularly reviewed. Suggestions for improvements to approved standards, addressed to the Manager, Standards department, are welcome.

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2017-03-09	New Issue	Rotich Benard	Dr. Eng. Peter Kimemia

FOREWORD

This specification has been prepared by the Standards Department in collaboration with Quality Control Section, Supply Chain, Logistics Department, both of the Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for Universal Testing Machine (Hydraulic Type) herein called the 'machine'.

This machine shall be used for the determination of tensile and compressive properties of materials. Other tests that the machine shall carry out include adhesion test, ductility test, fatigue/ cyclic test, flexure/ bending test and shear/ torsion test. Information obtained from these tests shall be useful in quality control and mechanical property evaluations for materials procured by Kenya Power.

The machine shall be supplied, installed, tested and commissioned at the KPLC's Materials Testing Facility located at Donholm in Nairobi, Kenya.

The specification stipulates the minimum requirements for the Universal Testing Machine acceptable for use in the company and it shall be the responsibility of the Supplier to ensure adequacy of the design, good engineering practice, and adherence to this specification and other applicable standards and regulations as well as ensuring good workmanship in the manufacture of the machine for KPLC.

It is the responsibility of the manufacturer/supplier to ensure that the offered machine is of the highest quality and guarantees excellent service to KPLC.

The following are members of the team that developed this specification:

Name	Department
Eng. Simon Kimitei	Quality Control
Rotich Benard	Standards

1. SCOPE

1.1. This specification is for the Universal Testing Machine (hydraulic type) and covers the supply, delivery, installation and commissioning. The scope also includes training on the operation and routine maintenance of the machine.

1.2. The specification stipulates the minimum requirements for a universal testing machine to be used in determining the material properties of products used in the power industry (transmission and distribution of electricity) such as steel structures, fasteners, copper and aluminium busbar tubes, steel, copper and aluminium conductors, grounding rods and similar products, etc.

2. REFERENCES

2.1. NORMATIVE

The following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply.

ISO 376: Metallic materials - Calibration of force-proving instruments used for the verification of uniaxial testing machines

ISO 6892: Metallic materials - Tensile testing at ambient temperature

ISO 7500-1: Metallic materials — Verification of static uniaxial testing Machines, Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system

ISO 9513: Metallic materials - Calibration of extensometers used in uniaxial testing

ASTM E4: Practices for Force Verification of Testing Machines

ASTM E74: Practice for Calibration of Force Measuring Instruments for Verifying the Force Indication of Testing Machines

ASTM E83: Practice for Verification and Classification on Extensometer Systems

ASTM E1012: Practice for Verification of Test Frame and Specimen Alignment Under Tensile and Compressive Axial Force Application

ASTM E1856: Standard Guide for Evaluating Computerized Data Acquisition Systems Used to Acquire Data from Universal Testing Machines.

BS 183: Specification for general purpose galvanized steel wire strand

2.2. INFORMATIVE

ISO/IEC 17025: General Requirements for the Competence of Testing and Calibration Laboratories

ASTM E8 / E8M: Standard Test Methods for Tension Testing of Metallic Materials

ASTM A720 / A720M - 02(2011): Standard Test Method for Ductility of Non-Oriented Electrical Steel

ASTM E290: Test Method for Bend Testing of Material for Ductility

3. TERMS AND DEFINITIONS

3.1. DEFINITIONS

For the purpose of this specification the definitions given in the reference standards shall apply. The following shall also apply:

Compression test: Used to determine how a material reacts when it is compressed, squashed, crushed or flattened by measuring fundamental parameters that determine the specimen behaviour under a compressive load. Usually done on materials of high compression but low tensile strength, in which the material is subjected to increasing compressive forces until failure occurs.

Adhesion test: (Also called peel test) A test performed between two substrates bonded together with an adhesive. The substrates may be both flexible or one may be flexible while the other is rigid. The adhesive itself will generally take the form of a thin layer between the two substrates such as the adhesive located on the underside of a piece of tape that has been placed against a steel plate.

Ductility test: The test involves determining the extent by which a material can withstand plastic deformation without rupture.

Fatigue Test: (Also called cyclic test) A method for determining the behaviour of materials under fluctuating (cyclic) loads. A specified mean load (which may be zero) and an alternating load are applied to a specimen and the number of cycles required to produce failure (fatigue life) is recorded.

Flexure test: A test done by laying a material horizontally over two points of contact (lower support span) and then a force is applied to the top of the material until it fails. The maximum recorded force is the flexural strength of that particular sample. Done on relatively flexible materials such as polymers, wood and composites

Torsion test: A test carried out by twisting (rotating about its axis) one end of a material to a specified degree, with a specified force, while the other end is anchored so that it cannot move or rotate. The purpose the test is to determine the behaviour a material when twisted as a result of applied moments that cause shear stress about the axis.

Fibre-Reinforced Plastic (FRP): (Also called fibre-reinforced polymer) Is a composite material made of a polymer matrix reinforced with fibres. The fibres are usually glass, carbon, aramid, or basalt. Used in the manufacture of utility poles because of their higher strength-to-weight ratio.

3.2. ABBREVIATIONS

KPLC:	Kenya Power and Lighting Company Limited
ISO:	International Organization for Standardization
PC:	Personal Computer
FRP:	Fibre-Reinforced Plastic
TMT Steel:	Thermo Mechanically Treated steel
DPI:	Dots Per Inch
USB:	Universal Serial Bus
LAN:	Local Area Network
RS 232:	Standard for serial communication transmission of data

4. REQUIREMENTS

4.1 SERVICE CONDITIONS

The Universal Testing Machine shall be suitable for use indoors in tropical areas and harsh climatic conditions including areas exposed to:

a) Altitudes of up to 2200m above sea level and humidity of up to 95%,

b) Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C, in direct sunlight,

4.2 DESIGN AND CONSTRUCTION

4.2.1 The machine shall be manufactured to applicable IEC Standards, Kenya Standards, ISO standards including ISO 7500-1, ISO 376, ISO 6892, ISO 9513 and the requirements of this specification.

4.2.2 The Universal Testing Machine shall be Class 0.5 as per ISO 7500-1 with 600kN capacity.

4.2.3 The machine shall be robust, strong and durable, with a compact load frame that provides greater flexibility of placement, and offering excellent accuracy and ease of use.

4.2.4 The machine shall carry out the following tests:

a) Tensile test
b) Compression test
c) Adhesion test
d) ductility test
e) fatigue/ cyclic test
f) flexure / bending test
g) Shear / torsion test

4.2.5 The machine shall be automatic dual stage servo controlled power pack with digital controller (computer-controlled).

4.2.6 The machine shall be hydraulic type manufactured and designed for heavy duty applications in the laboratory.

4.2.7 Materials Range

The machine shall be suitable for determining material properties of power industry items including but not limited to the following:

a) Copper and aluminium conductor wires of diameters in the range 0.1 to 10mm
b) Steel wires of diameter in the range 1mm to 10mm
c) Steel wire ropes (to BS 183) of diameter in the range 3mm to 25mm and breaking loads of up to 200kN
d) Copper and aluminium tubes (busbar tubes) of thickness in the range 1mm to 5mm and overall diameters in the range 25mm to 125mm
e) Steel round rods of diameters in the range 10mm to 30mm. This includes stay rods of diameter in the range 10mm to 25mm and breaking loads of up to 200kN.
f) Steel bars, textile samples and other round and flat specimens.
g) Polymers such as FRP, Polyimides, Epoxy esters

4.2.8 The Universal Testing Machine shall also have the following minimum characteristics, features and ratings as shown in Table 1:

Table 1: Minimum Characteristics, Features and Ratings of the Universal Testing Machine

No	Description	Minimum Requirement
1	**Test Speed**	
	Minimum test Speed	0.01 mm/min
	Maximum test Speed	500 mm /min
	Full and Return Speeds	Compatible with above Speed
	Max. Force at Full Speed	Compatible with Full speed
2	**Dimensions and Features of cross heads** (*movable cross head controlled to move up or down)*	
	Width	Preferable range of 1000-1200 mm
	Depth	Preferable range of 500-600 mm
	Height	Preferable range of 1600-2000 mm
	Total Crosshead Travel	Preferable range of 1200-1400 mm
	Total Vertical Test Space	Preferable range of 1200-1400 mm
3	Data acquisition	As per ASTM E1856
4	Power Supply	230V 50Hz Single Phase
5	**Strain Measurement System**	
	Accuracy	~ 0.5 µm
	Repeatability	~ 0.25 µm
	Discrimination/Resolution	0.0004% of range
6	**Force Measurement System** *(Maximum permissible values for relative errors of the force-measuring system and for the relative resolution of the force indicator as per ISO 7500-1)*	
	Accuracy	± 0.5%
	Repeatability	0.5
	Reversibility	± 0.75
	Zero	± 0.05
	Relative resolution	0.25
7	**Load frame and drive system**	
	Lateral Motion	~ ±0.25mm maximum over full crosshead travel
	Speed Accuracy	~ ±0.1% of set speed for all forces within the capacity of the machine when averaged over the larger of 15seconds or 50mm
	Position Resolution	~ 0.6µm standard/ 0.06µm is optional with high resolution encoder
	Position Accuracy	The greater of 0.025mm or 0.025% of movement
8	**Measuring Units**	
	Micrometre type	Reading to 0.001mm
	Calliper type	Reading to 0.01mm

4.3 CONTROL SYSTEMS AND SOFTWARE FEATURES

4.3.1 The machine shall be computerized (computer controlled) through a test control application software.

4.3.2 The machine shall be supplied complete with desktop computer and desk/table of the design shown in Fig 1 with the necessary interfacing accessories.

4.3.3 The machine shall have RS-232, USB-2, LAN and wireless connection interfaces to the latest PC and printer.

4.3.4 The machine shall be supplied with necessary controls and computer system complete with relevant software and accessories. The computer shall be branded desktop computer with the following minimum configurations:

i. Intel i5 processor or higher,

ii. 4GB RAM,

iii. 500 GB HDD,

iv. DVD-RW,

v. I9 inch LED monitor,

vi. Keyboard and Mouse and

vii. Licensed copies of Windows™ 7/ its newer versions and latest MS office.

4.3.5 The desktop computer shall be installed with the test control application software compatible with Windows™ 7 and its newer versions (Clause 4.3.4 vii) to meet special application requirements. The application system shall be free and upgradable free of charge.

4.3.6 The test application software package shall allow the operator to conduct a wide range of tests with several array of test parameters like types of tests, loading speed, specimen shapes, etc. from the PC.

4.3.7 The software shall have test features as shown in Table 2:

Table 2: Test Software Features

No	Feature	Minimum Requirements
1.	Tests to choose	• Tests in Clause 4.2.4 • Single Shear • Double Shear

No	Feature	Minimum Requirements
		• Proof Test [Stress Vs %Strain]
2.	Real time Graphs	• Dual Graph - Stress Vs %Strain and Load Vs Displacement (If Extensometer is used) • Load Vs Displacement • Time graphs against any parameter (Load / Displacement / Strain / Extension etc.)
3.	Specimen Types and Shapes	• Material range in Clause 4.2.7 • Round • Flat Hollow • TOR / TMT Steel • Any type of specimen to be specified by manufacturer
4.	Data Entry Points	• Pre - Load Data Entry to avoid slippage in graph • Fully customized data entry • Extensometer Gauge Length Selection - 10, 25, 50 mm • Lower force and higher force data entry in % of maximum load to calculate proof stress
5.	Choice of Units	• Load - kN, Kg, N • Stress - kN/mm2, N/mm2, MPa, Kg/mm2 • Displacement- mm • Any other units of load, stress and displacement
6.	Results Parameters	Ultimate Load, Ultimate Strength, Displacement at Ultimate Load, Maximum Displacement, %Elongation, %Reduction in area, Breaking Load, Breaking Stress, Yield Load, Yield Strength, 0.02% Proof Strength, 0.1% Proof Strength, 0.2% Proof Strength, 0.5% Proof Strength, 1% Proof Strength, all Proof loads, Young's Modulus

4.3.8 Display and Output

4.3.8.1 The machine shall offer real-time graphic display of Load (or Stress) vs. Extension via the PC monitor.

4.3.8.2 Selectable graphical display presentation shall be possible as the tests progress. Test parameters shall be displayed with graph simultaneously.

4.3.8.3 Test force and curves, Elastic modulus, yield strength, extensibility shall be automatically displayed, stored and printed.

4.3.8.4 A branded colour printer for A4 size printing having minimum resolution of 600Dpi shall also be provided

4.3.8.5 The machine shall have a memory function for test data to be stored for future reference, reports, certification or presentations.

4.3.8.6 The software shall have the following additional capabilities in displaying the test results:

a) Fully customized result window

b) Operator can change all interfaces like color, font etc. as per preference

c) One can see graph of Stress Vs Displacement, Stress vs. %Strain, Stress vs. Strain

d) Curve colors can be change

e) Complete curve zoom facility

f) The following points on curve can be marked: Ultimate Load, Yield Load Displacement at Ultimate Load, Displacement at Yield Load, Proof Load

g) Operator can set graph grid as per preference/requirement

h) Operator can magnify selected portion of curve

i) Operator can see all data points in tabular format such as Load - Displacement, Stress - %Strain, etc.

j) Data point stressing facility by two ways - moving mouse on curve or by arrow key

k) Fully customized header and footer information for test report

l) Several report templates that are customizable

4.3.8.7 The Control Panel shall display all operational data e.g. displays all crosshead traveling values in relation to actual load value vs elongation.

Figure 1: General Arrangement of Universal Testing Machine and Desktop Computer

4.4 SPECIAL FEATURES

4.4.1 The machine shall have automatic program control of load rate, strain rate, and crosshead speed during loading. The manufacturer shall recommend settings to suit the tests required as per material range in Clause 4.2.7.

4.4.2 The machine shall be capable of performing repetitive cycling for:

a) position, strain or load,

b) count cycles,

c) record limits values and

d) auto shutdown on failure or on over-limit values.

4.4.3 The machine shall have special controls and passwords that guarantees the integrity of the test results and prohibits tampering and manipulation of test results.

4.4.4 Operator shall be able to set any test speed within capacity of the machine using keyboard entry

4.4.5 Various Measurement units shall be selectable on the computer monitor.

4.4.6 The operation shall have automatic Stop or Return following a sample break

4.4.7 The load cell used shall offer one-touch zero adjustment with load cell capacity discrimination to guarantee accuracy and speed the setup process.

4.5 STANDARD ACCESSORIES

The machine shall be supplied complete with all components and accessories for intended applications including the following:

a) Each unit shall have a full set of installation, commissioning and maintenance as well as software manuals describing the software installation and application for programming, the settings and configuration of the controls as well as downloading and analysis of data.

b) Each unit shall be complete with extensometer, tensile grips and jaw faces for round and flat specimens as well as specimens specified in Clause 4.2.7.

c) Extensometer for universal testing machine, 50mm gauge length, 10mm travel, 0.01mm accuracy.

d) Encoder, digital signal processor, solid state amplifier.

e) Wide variety of grips and fixtures

4.6 ACCURACY AND CALIBRATION

The machine shall be calibrated for each of the measuring ranges in accordance with the procedures laid out in ISO 7500-1:1999.

4.7 SPARES AND WARRANTY

4.7.1 All spares, labour, consumables and other costs required for proper functioning of the equipment including re-calibration during the first twelve months after installation & commissioning shall be provided by the supplier at no cost to KPLC.

4.7.2 The minimum warranty and guarantee period required shall be **five** years.

4.8 INSTALLATION AND COMMISSIONING

The contract shall include installation and commissioning of the universal testing machine. All parts and consumable required during installation and commissioning shall be provided by the supplier.

4.9 TRAINING

4.9.1 Following the delivery, installation and commissioning of the machine, the supplier shall conduct complete training for 15 KPLC Engineers/Technicians, in Nairobi Kenya.

4.9.2 The Training shall include theory on how the equipment works followed by practical demonstrations. All the operational, protection and control features of the machine shall be exhaustively explained and demonstrated, including the operation of the interface software

4.9.3 The Training shall be considered to have been successful once the engineers/ technicians are able to: -

a) Competently carry out all the operations on the equipment,

b) Establish communication from computer to the control mechanism and carry out complete parameter settings and download and analyse data,

c) Trouble shoot and analyse and rectify any minor breakdowns that may occur.

4.9.4 All the costs of conducting the training including the spare parts and consumables shall be borne by the supplier. KPLC shall meet the cost of the venue and the costs for its staff attending the training.

5. TEST AND ACCEPTANCE REQUIREMENTS

5.1. The Universal Testing Machine shall be inspected and tested in accordance with the requirements of this specification and applicable standards. It shall be the responsibility of the supplier to test or to have all the relevant tests performed.

5.2. After satisfactory installation and commissioning of the machine at the KPLC's Materials Testing Facility located at Donholm, performance evaluation and acceptance of the universal testing machine shall be done as per the procedure given in ASTM E1856 standard.

5.3. The firm shall provide training to KPLC personnel for satisfactory operation and maintenance of the machine, after successful commissioning.

6. MARKING AND PACKING

6.1. The following information shall be marked legibly and in a permanent manner on the machine and on each of the standard accessories:

a) The manufacturer's identity – name and mark;

b) Model Number, serial number;

c) Month and year of manufacture

d) Standard of manufacture

e) Markings required by the applicable standard.

f) The words 'Property of Kenya Power & Lighting Co. Ltd.'

6.2. Each accessory for use with the machine shall be packed in a manner so as to protect it from damage during transportation and storage.

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APPENDICES

APPENDIX A: TESTS AND INSPECTION (NORMATIVE)

A.1. Copies of certificates or reports for the Universal Testing Machine by a third party testing laboratory accredited to ISO/IEC 17025 shall be submitted with the offer for evaluation. A copy of the accreditation certificate for the testing laboratory shall also be submitted with the tender (all in English Language). Any translations of certificates and reports into English language shall be signed and stamped by the Testing Authority.

A.2. Certificates for the Universal Testing Machine to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods.

A.3. On receipt of the Universal Testing Machine, KPLC will inspect it and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The supplier shall replace without charge to KPLC, any Universal Testing Machine or its accessories which upon examination/inspection, test or use fail to meet any of the requirements in the specification.

APPENDIX B: QUALITY MANAGEMENT SYSTEM (NORMATIVE)

B.1. The Supplier shall submit a Quality Assurance Plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation, will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008 or 2015.

B.2. The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 or 2015 certificate shall be submitted with the tender for evaluation.

B.3. The bidder shall indicate the delivery time of the Universal Testing Machine, manufacturer's monthly and annual production capacity and experience in the production of the machine for KPLC.

APPENDIX C: TECHNICAL DOCUMENTATION (NORMATIVE)

C.1. The bidder shall submit its tender complete with technical documents for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:

a) Fully-filled clause by clause Guaranteed Technical Particulars (GTPs — Appendix D) signed by the manufacturer;

b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;

c) An undertaking by the manufacturer to train KPLC staff on the operation and maintenance of the machine after duly commissioning.

C.2. The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

a) Fully-filled clause by clause Guaranteed Technical Particulars (GTPs) stamped and signed by the manufacturer **(these are not the ones submitted with the tender)**;

b) Authentic manufacturing drawings, stamped and signed by the manufacturer, with details of items including the standard accessories coming with the machine.

c) Bidder's personnel demonstrating to KPLC Staff (in Nairobi) the use of the machine and explain the features that guarantee excellent service.

d) Quality assurance plan (QAP) that will be used to ensure that the design, material; workmanship, tests, service capability, maintenance and documentation will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008 or 2015.

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APPENDIX D: GUARANTEED TECHNICAL PARTICULARS (GTPS) — NORMATIVE

(to be filled and signed by the Supplier and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for previous five years, four customer reference letters, details of suppliers' capacity and experience; and copies of complete type test certificates and test reports for tender evaluation, all in English Language)

Tender No. .....

Bidder's name and Address.....

Description		Bidder's offer
1. Manufacturer's Name and Country of manufacture		State
2. Type Reference/Model Number of item		State
3. List of components to be supplied (for one installation)		Specify
Clause	**Description**	**Bidders offer***
1.1	Scope of the work	State
1.2	Materials the machine test	State
2	Applicable Standards	List
4.1	Service conditions	Specify
4.2.1	Manufacturing standards	State
4.2.2	Class of the machine and testing capacity	Specify
4.2.3	Load frame type and robustness	Specify
4.2.4	Tests carried out by the Universal Testing Machine	Specify
4.2.5	Machine automatic and computerized (computer controlled)	Specify
4.2.6	Machine type and design application	State
4.2.7	Materials range tested	Specify
4.2.8	**Minimum characteristics, features and ratings of the Universal Testing Machine**	
	1. Test Speed	
	Minimum test Speed	Specify
	Maximum test Speed	Specify
	Full and Return Speeds	Specify
	Max. Force at Full Speed	Specify
	2. Dimensions and Features of cross heads	
	Width	Specify
	Depth	Specify
	Height	Specify
	Total Crosshead Travel	Specify
	Total Vertical Test Space	Specify

	3. Data acquisition	Specify
	4. Power Supply	Specify
	5. Strain Measurement System	
	Accuracy	Specify
	Repeatability	Specify
	Discrimination/Resolution	Specify
	6. Force Measurement System	
	Accuracy	Specify
	Repeatability	Specify
	Reversibility	Specify
	Zero	Specify
	Relative resolution	Specify
	7. Load frame and drive system	
	Lateral Motion	Specify
	Speed Accuracy	Specify
	Position Resolution	Specify
	Position Accuracy	Specify
	8. Measuring Units	
	Micrometre type	Specify
	Calliper type	Specify
4.3.1	Machine control system	Specify
4.3.2	Machine accessories	State
4.3.3	Connection interfaces	Specify
4.3.4	Computer configurations and accessories	Specify
4.3.5	Name of the test control application software and compatibility with OS	State and Specify
4.3.6	Limitless array of test parameters from PC	Specify
4.3.7	**Test Software Features**	
	1. Tests to choose	Specify
	2. Real time Graphs	Specify
	3. Specimen Types and Shapes	Specify
	4. Data Entry Points	Specify
	5. Choice of Units	Specify
	6. Results Parameters	Specify
4.3.8.1	Machine offering real time display via PC monitor	Specify
4.3.8.2	Selectable graphical display presentation possible	Specify
4.3.8.3	Instant display parameters	State
4.3.8.4	Provided Printer configurations	State

4.3.8.5	Machine memory function capabilities	Specify
4.3.8.6	Additional test control software capabilities	State
4.3.8.7	Control panel displays all operational data	Specify
4.4.1	Manufacturer's recommended settings to control load rate, strain rate during loading	Specify
4.4.2	Repetitive cycling done for	Specify
4.4.3	Presence of special controls and password	Specify
4.4.4	Test speed setting via PC keyboard	Specify
4.4.5	Selectable measurement units on the monitor	Specify
4.4.6	Operation has automatic STOP and Return when sample breaks	Specify
4.4.7	Load cell offering one touch zero adjustment	State
4.5	Standard accessories supplied with the machine	State
4.6	Calibration standard	State
4.7.1	List of spares that accompanies the machine	State
4.7.2	Warranty Period	Specify
4.8	Contract includes installation and commissioning	Specify
4.9	Supplier shall conduct training for KPLC engineers	Specify
5.1	Machine shall comply with the specification test requirements.	State
5.2	Performance and evaluation as per ASTM E1856	State
5.3	Firm shall provide successful training to KPLC personnel	State
6.1	Marking on the machine and standard accessories	Specify
6.2	Packing to protect from damage during transport, handling and storage	Specify
A1	Certificates or reports submitted with offer	State
A2	Test and calibration certificates to be submitted for approval before shipment	State
A3	Supplier shall replace without charge to KPLC items that don't meet specification	State
B1	QAP and ISO 9001:2008/2015	State
B2	Copies of quality management certifications attached	State
B3	Delivery time, Production capacity and experience of the manufacturer	State
C1	Documents submitted with tender documents for evaluation	
	a. Fully filled GTPs	State
	b. Copies of manufacturer's catalogues, manufacturing drawings, technical data	State
C2	To be submitted for approval before manufacture	

	a. Fully Filled Clause by clause GTPs **(not the ones submitted with the tender)**	state
	b. Authentic manufacturing drawings, signed and stamped by the manufacturer	Specify
	c. Bidder's personnel demonstrating the machine suitability to KPLC staff in Nairobi	State
	d. QAP Plan	State

** Words like 'agreed', 'confirmed', 'As per KPLC specifications', etc. shall not be tolerated and shall be considered non-responsive.*

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Manufacturer's Name, Signature, Stamp and Date