DOCUMENT NO.: KP1/13D/4/1/TSP/09/043-13

Kenya Power

LIVE LINE TOOLS: PART 13: UNIVERSAL TOOLS KIT FOR INSULATED HAND TOOLS – SPECIFICATION

A Document of the Kenya Power & Lighting Co. Plc
May- 2022

TABLE OF CONTENTS

0.1 CIRCULATION LIST

COPY NO.	COPY HOLDER
1	Manager, Standards
2	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.

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2022-05-17	Date: 2022-05-17

0.2 AMENDMENT RECORD

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2022-05-17	New Issue	Nancy Wairimu	Eng. Simon Kimitei

FOREWORD

This Specification has been prepared by the Standards Department in collaboration with Network Management Division, both of The Kenya Power and Lighting Company Plc. (KPLC) and it lays down requirements for Universal tools kit for insulated hand tools. It is intended for use by KPLC in purchasing these items.

This specification was prepared to establish and promote uniform requirements for Universal tools kit for insulated hand tools to be used by Kenya Power and Lighting Company Plc in medium Voltage overhead lines.

This specification stipulates the minimum requirements for Universal tools kit for insulated hand tools acceptable for use in the company and it shall be the responsibility of the supplier(s) and manufacturer to ensure that the offered design is of the highest quality and guarantees excellent service to KPLC and good workmanship in the manufacture of Universal tools kit for insulated hand tools for KPLC.

Users of KPLC specifications are responsible for its correct interpretation and application.

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

Name	Division
Peter Muthua Waweru	Institute of Energy Studies & Research
Richard Kioko	Network Management
Nancy Wairimu Mungai	Institute of Energy Studies & Research

1. SCOPE

1.1. This specification stipulates the minimum requirements for Universal tools kit for insulated hand tools for use in live line works on distribution and transmission power lines, in Substations and electrical installations.

1.2. This specification covers the following tools within the framework of universal Toolkit for Live Line work:-

a) Disconnect head
b) Hack saw and blade
c) Tree pruning saw
d) Clamp stick head
e) Skinning knife
f) Cleaning brush and replacements
g) Adjustable insulator fork.
h) Hot Rodder
i) Tie wire claw
j) Utility head
k) All angle pliers
l) Ball socket adjuster
m) Clear Vision Mirror
n) Tool for "W" Keys
o) Hammer
p) Ratchet Wrench
q) Rotary Prong
r) Screw Driver
s) Shepherd hook
t) Snap out cotter key remover
u) Universal adapter
v) Universal cotter key pusher
w) Hand guards

1.3. This specification stipulates the minimum requirements, inspection and tests of tools as well as guaranteed technical particulars.

2. NORMATIVE REFERENCE

The following standard and guidelines contain provision, which, through reference in this text, constitute provisions of this specification. For dated editions, the cited edition will apply; for undated editions, the latest edition of the referenced document shall apply.

IEC 60832-2: Live Working: Insulating Sticks and attachable devices: Part 2: Attachable devices

OSHA Regulation 1910.269: Part J: Live Line Tools

IEC 61472 ed3.0: Live working –Minimum approach distances for a.c. systems in the voltage range 72.5 kV to 800 kV – A method of calculation;

ANSI H35.1: Alloy and Temper Designation System for Aluminium

IEC 61318: Live working - Conformity assessment applicable to tools, devices and equipment

ISO 9001: 2015: Quality Management System - Requirements

3. DEFINITIONS AND ABBREVIATIONS

For the purpose of this specification, the definitions and abbreviations given in the reference standards shall apply.

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

4.1.1. General

The tools shall be suitable for use outdoors in tropical areas and harsh climatic conditions including areas exposed to:

a) Altitudes of up to 2200m above sea level;
b) Humidity of up to 95%;
c) Average ambient temperature of $+30^0$C with a minimum of -1^0C and a maximum of $+40^0$C;
d) Heavy Saline conditions along the coast.

4.1.2. Approach & Insulation Distance Information

MAD = Minimum Approach Distance is the minimum air gap or summation of air gaps measured between any part of the operator and live electrical apparatus. Detailed information can be found in IEC 61472 ed. 3.0 and a small extraction from this standard is below for minimum standard distances based on ideal circumstances.

Table 1: Working Recommended Minimum Distances at a Glance

Nominal Voltage AC (kV) Auto-reclose Distance	Minimum Approach Distance (MAD)	
	Phase to Earth	Phase to Phase
	OFF (mm)	OFF (mm)
11	800	950
33	800	1100
66	900	1300
132	1200	1900
220	1700	2800

4.2. DESIGN AND CONSTRUCTION

4.2.1. General Requirements

4.2.1.1. The attachable devices shall be manufactured and tested as per the requirements IEC 60832-2, ASTM F7-11, IEC 61235 and OSHA Regulation standards 1910.269: Part J.

4.2.1.2. The metallic castings shall be made from heat treatable aluminum alloy of class 6061-T6 as per ANSI H35.1 with properties recommended by Aluminium Association as shown in table 2 below:

Table 2: Properties of Aluminium Alloy (Al 6061 T6)

No.	Property/ Parameter	Units	Requirements
Physical Properties			
1	Density	g/cm^3	2.70
2	Melting point	°C	650
3	Thermal Expansion	/K	23.4×10^{-6}
4	Modulus of Elasticity	GPa	70
5	Thermal Conductivity	W/mK	166
6	Electrical Resistivity	Ω.m	0.040×10^{-6}
Mechanical Properties			
1	Proof Stress	Mpa	270
2	Tensile Strength	Mpa	310
3	Elongation A5	%	12
4	Shear Strength	Mpa	190
5	Hardness, Vickers	HV	100
6	Poisson's ratio	_	0.33

No.	Property/ Parameter	Units	Requirements
	Chemical Composition		
1	Aluminium, Al	%	95.8 – 98.6
2	Chromium, Cr	%	0.04 – 0.35
3	Copper, Cu	%	0.15 – 0.4
4	Iron, Fe	%	Max 0.7
5	Magnesium, Mg	%	0.8 – 1.2
6	Manganese, Mn	%	Max 0.15
7	Silicon, Si	%	0.4 – 0.8
8	Titanium, Ti	%	Max 0.15
9	Zinc, Zn	%	Max 0.25
10	Other, each	%	Max 0.05
11	Other, total	%	Max 0.15

4.2.2. Specific Requirements for Universal Tools

4.2.2.1. Disconnect Head

4.2.2.1.1. The tool shall be made of either heat treated aluminium alloy or bronze and be designed for opening and closing switches, opening enclosed cutouts, etc.

4.2.2.1.2. It shall be designed to be used by the disconnect tools such as Telescoping Measuring and other universal hot sticks.

4.2.2.2. Hack Saw and blade

4.2.2.2.1. It shall be designed for use at various angles where a hack saw is needed near energized conductors.

4.2.2.2.2. The hacksaw frame shall be made from heat treated aluminium alloy.

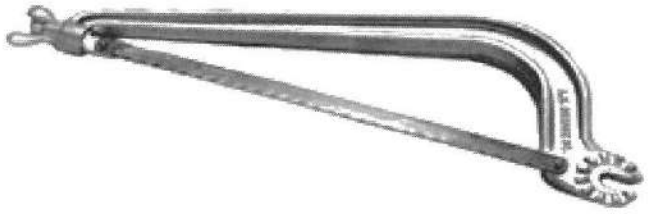
4.2.2.2.3. Shall be supplied complete with 10 blades, manufactured from high speed steel for their teeth, giving greatly improved cutting and tooth life.

4.2.2.2.4. Specific dimensions of the hacksaw blades are as follows:

a) Hole to Hole: 11 7/8 inches / 300 mm

b) Overall blade length: 12 3/8 inches / 315 mm (not tightly controlled)
c) Mounting Hole diameter: 9/64 to 5/32 inch / 3.5 to 4 mm (not tightly controlled)
d) Blade Width: 7/16 to 33/64 inch / 11 to 13 mm (not tightly controlled)
e) Blade Thickness: 0.020 to 0.027 inches / 0.5 to 0.70 mm (varies with tooth pitch and other factors)

4.2.2.2.5. The kerf produced by the blades is somewhat wider than the blade thickness due to the set of the teeth. This shall vary between 0.030 and 0.063 inches / 0.75 and 1.6 mm depending on the pitch and set of the teeth.



4.2.2.3. **Tree Pruning Saw**

4.2.2.3.1. These saws shall be designed for use with a Pistol-Grip Handle, Tree Trimmers, Universal or Telescoping Tools.

4.2.2.3.2. The Saw shall have a black Teflon (Poly Tetra Flouro Ethylene) coating on fine-toothed blade for smooth, non-stick action and fast cutting.

4.2.2.3.3. The saw shall have curved blade 400mm long with 7 teeth per 25mm and Universal Head

4.2.2.3.4. It shall also have a laser-cut blades made from a unique steel alloy with an impulse-hardened teeth and a hard chrome plating, which gives the saw blade an extra hard, durable surface that is rust-resistant and easily wipes clean;

4.2.2.3.5. The tapered-ground blades which means that the blades are thicker near the teeth than near the spine of the blade, shall keep the saw moving freely and prevents it from binding in the cut.

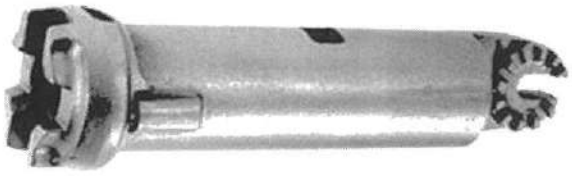
4.2.2.3.6. The saw shall be supplied with a custom, hard-plastic sheathe to protect the blade when not in use, or to wear on the belt as a scabbard.

4.2.2.3.7. The handle shall be have a thicker housing and the pole end has a shock absorbing base

4.2.2.4. **Clamp Stick Head**

4.2.2.4.1. A Universal Clamp Stick Head shall be used with Eye Screw Grounding Clamps. The 6" head is for long eye screw grounding clamps.

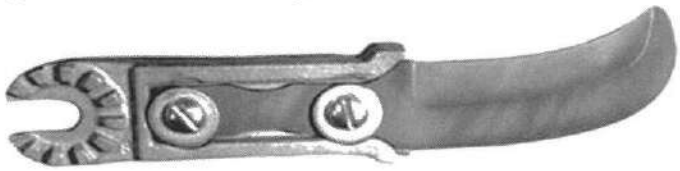
4.2.2.4.2. Shall be constructed of bronze or heat treated aluminium aluminum, and shall be designed to be installed on universal sticks or clamp sticks by using a shotgun adapter.



4.2.2.5. **Skinning knife**

4.2.2.5.1. The knife shall be constructed for cutting or scraping insulation, cleaning conductors, etc., prior to making splices.

4.2.2.5.2. The design shall be appropriate for use with a universal pole that permits work near energized lines with safety



4.2.2.6. **Cleaning brush and replacements**

4.2.2.6.1. The brush shall have a V-shape which gives it 2-sided cleaning action. As brushes wear, they can be rotated, by loosening the anchor screws, so that unused bristles will come in contact with conductor.

4.2.2.6.2. The handle shall be made of epoxy glass handle and tested as OSHA regulation and ASTM F-11 requirements.

4.2.2.7. **Adjustable insulator fork**

4.2.2.7.1. Designed to grasp 9" and 10" disk insulators used in dead-end construction, shall be capable of raising most pin type insulators up to 15 lb.

4.2.2.7.2. The jaw shall be made of fiber that opens and closes by a rotating screw. Jaws adjust from 3" to 4¼"across inside center of fork.

4.2.2.8. **Hot Rodder Tool**

4.2.2.8.1. Ideal for applying line ties and other formed wire products on energized lines.

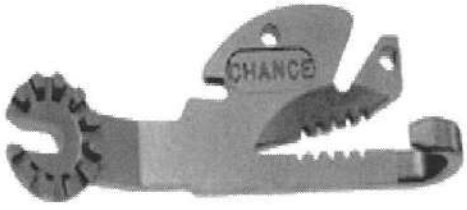
4.2.2.8.2. The loop type work end permits rotational control which is difficult with conventional tying tools.

4.2.2.8.3. This unit is particularly adaptable to Super Top-Ties.

4.2.2.9. **Tie Wire Claw**

4.2.2.9.1. Hand-like hot line tool easily and neatly applies tie wires, both factory formed and field-formed.

4.2.2.9.2. Claw controls wire with grip equal to pliers, permits securely wrapping tight coils onto conductors.



4.2.2.10. **Utility Head**

Gator-look shape makes Utility Head popular for many hot line jobs: Placing and removing blocks, slings, circuit breakers, line hooks and strain breakers.

4.2.2.11. **All Angle Pliers**

4.2.2.11.1. Shall be designed to grasp from any angle and tighten by clockwise rotation of the universal tool handle.

4.2.2.11.2. The jaws shall be held firmly in position with a wing nut.

4.2.2.12. **Ball Socket Adjuster**

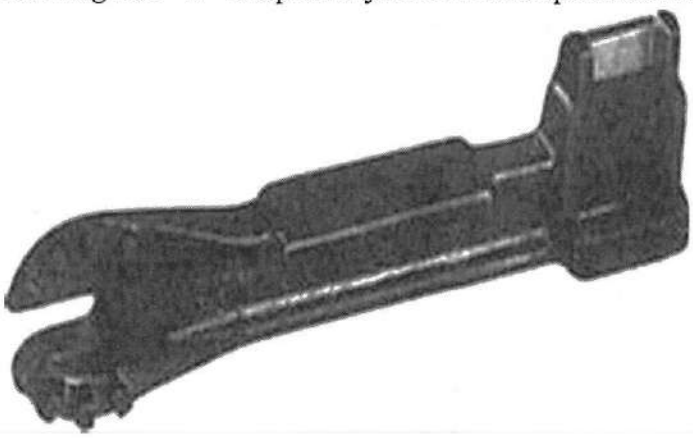
Used in controlling the adapter between clevis clamps and socket insulator pins

4.2.2.13. **Clear Vision Mirror**

Made with angle adjustment to enable operator to inspect insulators, switch bases and other equipment which is difficult to see without coming in contact with energized conductors.

4.2.2.14. **Tool for "W" Keys**

Tool used for handling the "W" shaped keys used in suspension insulators.

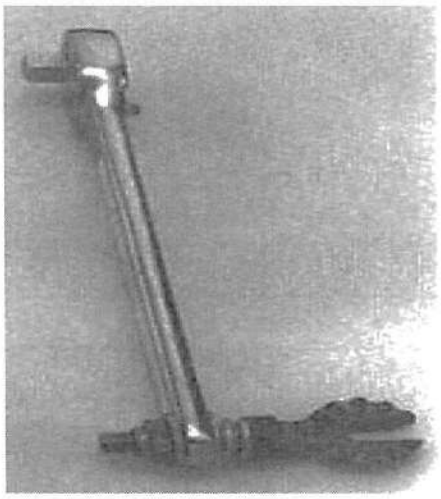


4.2.2.15. **Hammer**

Shall be used for operation around energized conductors in places requiring a forceful blow

4.2.2.16. **Ratchet Wrench**

Shall be used for tightening bolts using universal stick in transmission and distribution live line work.



4.2.2.17. **Rotary Prong**

Shall be head treated aluminum alloy body. Prong swivels freely permitting a full turn on the tie wire without releasing contact.

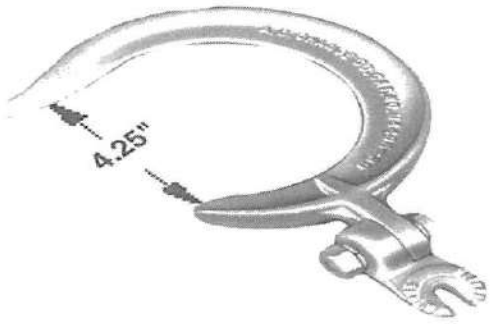
4.2.2.18. **Screw Driver**

Shall be ideal for a number of odd jobs where an insulated tool is needed.

4.2.2.19. **Shepherd hook**

4.2.2.19.1. Shephard hook shall be heat treated aluminum alloy and be a self-aligning hook designed for pulling and lifting insulator strings.

4.2.2.19.2. Swivel action should permit it to rotate and maintain its alignment with the insulator at all times

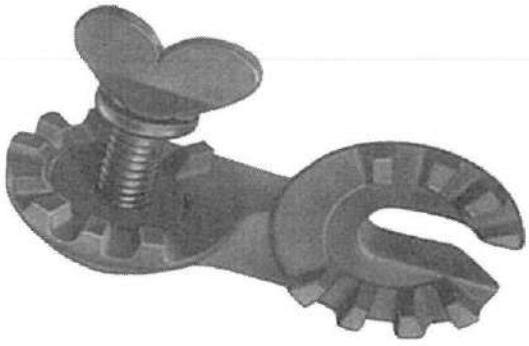


4.2.2.20. **Snap out Cotter Key Remover**

Snap out cotter key remover shall be suitable for use in pulling out stuck cotter keys.

4.2.2.21. **Universal Adapter**

Shall be designed to be mounted on a universal tool and allow tools be set at any angle to the stick



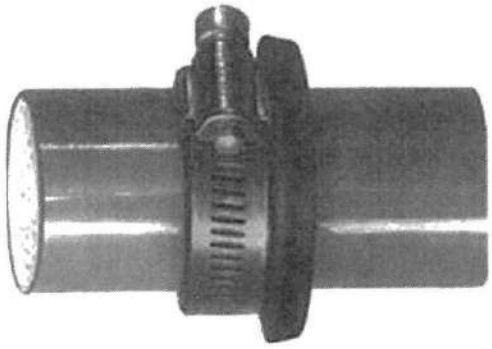
4.2.2.22. **Universal Cotter Key Pusher**

Used to partially withdraw a ball-socket cotter key so that the insulator can be removed from another insulator hunger.

4.2.2.23. **Hand Guards**

4.2.2.23.1. Shall be made of flexible rubber and provision for tightening on insulating sticks by means of a jubilee clip.

4.2.2.23.2. Rubber to be used for maintaining minimum clearance between hand and the working of live line tools.



5. TESTS REQUIREMENTS

The tools shall be inspected and tested in accordance with relevant international standards.

6. PACKING AND MARKING

6.1. PACKING

6.1.1. The insulated hand tools shall be packed in such a manner so as to avoid damage during transportation and storage.

6.2. MARKING

6.2.1. The following information shall be legibly and indelibly marked on tools:

a) Manufacturers Name or Trademark;
b) Country of origin;
c) Standard of manufacture;
d) Type reference number;
e) KPLC Logo;
f) The words "**PROPERTY OF KPLC**"

6.2.2. Instruction of storage, handling and use shall be included in each package, all in English language.

APPENDICIES

A: TESTS AND INSPECTION (Normative)

A.1 It shall be the responsibility of the supplier to test or to have all the relevant tests performed.

A.2 Copies of Type Test Certificates and Type Test Reports issued by a Third Party Testing Laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical 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 test reports into English language shall be signed and stamped by the Testing Authority.

A.3 The bidder shall provide current e-mail address, fax and telephone numbers and contact person at the Testing Laboratory where Type Tests were carried out.

A.4 The tools shall be subjected to acceptance tests at the manufacturer's works before dispatch. Two Engineers appointed by KPLC shall witness acceptance tests.

A.6 On receipt of the tools, KPLC will inspect them 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 the tools, which upon examination, test or use fail to meet any or all of the requirements in the specification.

B: QUALITY MANAGEMENT SYSTEM (Normative)

B.1 The supplier shall submit a Quality Assurance Plan (QAP) that will be used to ensure that the Leakage Current Monitor physical properties, tests and documentation, will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001: 2015.

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

B.3 The bidder shall indicate the delivery time of the tools, manufacturer's monthly & annual production capacity and experience in the production of the type and size of items being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers for similar type of the tools sold in the last five years as well as reference letters from at least four of the customers shall be submitted with the tender for evaluation.

C: 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 (GTP) signed by the manufacturer, specific values shall be filled in, terms like "yes", "Agree" , "complied" shall not be acceptable;
b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
c) Sales records for the last five years and at least four customer reference letters;
d) Details of manufacturing capacity and the manufacturer's experience;
e) Copies of required Type Test Reports by a Third Party Testing Laboratory accredited to ISO/IEC 17025;
f) Copy of Accreditation Certificate to ISO/IEC 17025 for the Third Party Testing Laboratory;
g) Manufacturers Letter of Authorization, ISO 9001:2015 Certificate and other technical documents required in the tender.
h) Manufacturer's warranty and guarantee; subject to at least 12 months from date of delivery to KPLC stores

C.2 The successful bidder (supplier) shall submit the following documents/details to KPLC for approval before manufacture:

a) Fully filled clause by clause Guaranteed Technical Particulars (GTP) stamped and signed by the manufacturer, specific values shall be filled in, terms like "yes", "Agree" , "complied" shall not be acceptable;
b) Design Drawings with details of the tools to be manufactured for KPLC.
c) Quality Assurance Plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2015.
d) Detailed test program to be used during factory testing;
e) Marking details and method to be used in marking the tools;
f) Packaging details (including packaging materials).

D: GUARANTEED TECHNICAL PARTICULARS (Normative)

To be filled and signed by the Manufacturer 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. ……

Clause number	ITEM DESCRIPTION			KPLC REQUIREMENTS	Bidder's offer
Manufacturer's Name and address					State
Country of Manufacture					State
Bidder's Name and address					State
1.	Scope				State
2.	Normative References				State
3.	Definitions and Abbreviations				State
4.	Requirements				
4.1	Service Conditions				
4.1.1	General				
	Operating conditions	Altitude		2200mm	State
		Humidity		95%	State
		Temperature	Average	+30^{0}C	State
			Minimum	-1^{0}C	State
			Maximum	+40^{0}C	State
		Saline conditions		Heavy	State
4.1.2	Approach & Insulation Distance Information	Standard of working recommended minimum distance at a glance		IEC 61472 ed. 3.0	State
4.2	**Design and Construction**				

Clause number	ITEM DESCRIPTION	KPLC REQUIREMENTS	Bidder's offer
4.2.1	Standard of manufacture	IEC 60832-2, ASTM F7-11, IEC 61235 OSHA Regulation standards 1910.269: Part J	State
4.2.1.2	Metallic casting material	Al 6061- T6	State
	Standard of manufacture	ANSI H35.1	State
	Properties of Aluminium Alloy (Al 6061 T6)		
	Property/Parameter	**Requirements**	
	Physical Properties		
	Density	2.70 g/cm^3	State
	Melting point	650 °C	State
	Thermal Expansion	23.4 x 10^{-6} /K	State
	Modulus of Elasticity	70 GPa	State
	Thermal Conductivity	166 W/mK	State
	Electrical Resistivity	0.040 x 10^{-6} Ω.m	State
	Mechanical Properties		
	Proof Stress	270 MPa	State
	Tensile Strength	310 MPa	State
	Elongation A5	12 %	State
	Shear Strength	190 MPa	State
	Hardness, Vickers	100 HV	State
	Poisson's ratio	0.33	State
	Chemical Composition		
	Aluminium, Al	95.8 – 98.6 %	State
	Chromium, Cr	0.04 – 0.35 %	State
	Copper, Cu	0.15 – 0.4 %	State
	Iron, Fe	Max 0.7 %	State
	Magnesium, Mg	0.8 – 1.2 %	State
	Manganese, Mn	Max 0.15 %	State
	Silicon, Si	0.4 – 0.8 %	State
	Titanium, Ti	Max 0.15 %	State
	Zinc, Zn	Max 0.25 %	State

Clause number	ITEM DESCRIPTION	KPLC REQUIREMENTS	Bidder's offer
	Other, each	Max 0.05 %	State
	Other, total	Max 0.15 %	State
4.2.2	**Specific requirements for Universal Tools**		
4.2.2.1	Disconnector Head		
4.2.2.2	Hacksaw and Blade		
4.2.2.3	Tree pruning saw		
4.2.2.4	Clamp stick Head		
4.2.2.5	Skinning knife		
4.2.2.6	Cleaning brush and replacements		
4.2.2.7	Adjustable insulator fork		
4.2.2.8	Hot rodder tool		
4.2.2.9	Tie wire claw		
4.2.2.10	Utility Head		
4.2.2.11	All angle Pliers		
4.2.2.12	Ball socket Adjuster		
4.2.2.13	Clear vision Mirror		
4.2.2.14	Tool for "W" Keys		
4.2.2.15	Hammer		
4.2.2.16	Ratchet wrench		
4.2.2.17	Rotary Prong		
4.2.2.18	Screw driver		
4.2.2.19	Shepherd hook		
4.2.2.20	Snap out Cotter Key Remover		
4.2.2.21	Universal Adapter		
4.2.2.22	Universal Cotter Key Pusher		
5.	Test Requirements	Shall be inspected and tested in accordance with relevant international standards.	State
6	**Packing and Marking**		
6.1	Packing		Specify
6.2	Marking		Specify
A	**Test and inspection**		
A.1	Responsibility of carrying out tests		State

Clause number	ITEM DESCRIPTION	KPLC REQUIREMENTS	Bidder's offer
A.2	Copies of Type Test Reports to be submitted with tender		Provide
A.3	Contacts of testing laboratory		Provide
A.4	Acceptance tests at the manufacturers works		State compliance
A.5	Test certificates to be submitted by supplier to KPLC for approval before supply/delivery		State compliance
A.6	Inspection at the stores and replacement of rejected items		State compliance
B	**Quality Management System**		
B.1	Quality Assurance Plan		Provide
B.2	Copy of ISO 9001:2015 Certificate or KEBS standardization mark for locally manufactured Masks		Provide
B.3	Manufacturer's experience		State
	Manufacturing Capacity (units per month)		State
	List of previous customers		State
	Customer reference letters		State
C	**Documentation**		
C.1	Documents submitted with tender		State compliance
C.2	Documents to be submitted by supplier to KPLC for approval before manufacture		State compliance
	Statement of compliance to specification (indicate deviations if any & supporting documents)		State compliance

.....

Manufacturer's Name, Signature, Stamp and Date