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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Head of Department Standards
2	Head of Department Procurement
Electronic copy (pdf) on KPLC server currently: http://172.16.1.40/dms/browse.php?fFolderId=23	

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue 0	2014-10-01	New issue	Michael Apudo	Eng. S Kimitei

FOREWORD

This specification has been prepared by the Standards Department in collaboration with Network Management, both of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for hand-operated cutting, compression, peeling and jointing tools for use on power lines. It is intended for use by KPLC in purchasing the tools.

1. SCOPE

1.1. This specification covers requirements for the hand-operated cutting, compression, peeling and jointing tools for use on power lines. They shall include:

a) Hand operated hydraulic wire cutter (24" & 36")
b) Hand operated manual wire cutter (24" & 36")
c) Hand operated hydraulic compression tool (up to 300mm^2 & 300 to 1000 mm^2)
d) Split hydraulic cable jointing tool kit (150-630mm^2)
e) Cable peeling and stripping tool

1.2. The specification also covers characteristics, dimensions, inspection and test of the hydraulic tools as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.

1.3. The specification stipulates the minimum requirements for the hydraulic tools; acceptable for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the hydraulic tools for The Kenya Power & Lighting Company.

The specification does not purport to include all the necessary provisions of a contract.

2. REFERENCES

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 9461: Hydraulic fluid power -- Identification of valve ports, sub-plates, control devices and solenoids

ISO 10763: Hydraulic fluid power—Plain-end, seamless and welded precision steel tubes—Dimensions and nominal working pressures.

ISO 4957: Tool steels

3. TERMS AND DEFINITIONS

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

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

The hand-operated cutting, compression, peeling and jointing tools shall be tropicalized, designed and constructed for continuous outdoor operation in tropical areas and harsh climatic conditions including areas exposed to:

a) Sea spray (along the coast),
b) Humidity of up to 95% and
c) Average ambient temperature of +30°C; with a minimum of -1°C and a maximum of +40°C.

4.2. DESIGN AND CONSTRUCTION

4.2.1. **Hand operated hydraulic wire cutter**

4.2.1.1. The conductor hand operated hydraulic cutter design and manufacture shall conform to the requirements of ISO 9461 and ISO 10763 standard requirements and those of this specifications.

4.2.1.2. The cutter handle insulation shall be dielectrically tested to 10 kV AC according to IEC 60900 standard - insulated hand tools.

4.2.1.3. The cutting tool shall be designed to cut guy wires, anchor rods and most overhead and underground cables. The cutters shall be portable, lightweight, and made to last years under the toughest field conditions.

4.2.1.4. The cutter shall possess an anvil style; center cut blades to eliminate jamming problems. The blades shall be easily replaced in the field.

4.2.1.5. The tools shall be made of high grade steel and have rubber handle grips. All tools shall be black zinc oxide coated to help reduce corrosion.

4.2.1.6. It shall also have a flip-top latch that opens the tool jaw to easily accept cables and wires. The head shall be rotated up to 180° to facilitate easy wire positioning and operator leverage. It shall also require a minimum pumping effort to produce specified output tonnage. The dimensions and capacity shall be as per Table 1.



Fig. 1: Hand operated hydraulic wire cutter

Table 1: Dimensions and capacity of hand operated hydraulic wire cutter

Length of the tool		Soft and medium hard materials (Up to HRC 31)		Hard materials up to HRC 48		Approximate weight
inch	mm	inch	mm	inch	mm	kg
24	610	7/8	11	5/6	8	3
36	914	9/16	14	7/16	11	6
42	1047	11/16	18	1/2	13	8

4.2.2. **Hand operated manual wire cutter**

4.2.2.1. This shall be a professional quality well-constructed tool used to cut from soft, medium hard to hard materials.

4.2.2.2. The cutter's jaws shall have a heavy-duty strap jaws – straps shall keep the cutting edges aligned under the most demanding applications - with centre cut blade pattern, drop forged from high quality chrome vanadium steel, scientifically hardened, tempered and heat-treated to HRC 56-60 for strength..

4.2.2.3. The jaws shall also be drop-forged, precision ground, alloy tool steel (grade AISI - D2) jaws with strap connecting bolts to allow clearance adjustment that shall not work loose. They shall have slightly rounded cutting edges, bevelled on both sides to broaden the cutting applications.

4.2.2.4. It shall have a high leverage handles with rubber insulated grips dielectrically tested to 10 kV AC conforming to IEC 60900 for operating safety and comfort.

4.2.2.5. Specific features of the tool shall be:

a) **Precision cutting edges** – Shall be accurately bevelled for specific types of cuts and materials.
b) **Cutting jaws** – Shall be made of alloy tool steel, drop forged, precision ground for maximum wear resistance and longer cutting life.
c) **Lock plate** – Shall be able to prevent jaw bolts from turning or loosening. Shall also be suitable to eliminate "sloppy" head, insures trouble-free operation.
d) **Simple adjustment** – A provision for one adjustment to realign cutting edges properly.
e) **Toggle joint** – Shall transform 250N of hand pressure on handles to 18kN pressure on cutting edges of jaws.
f) **Steel tubular handles** – Shall have greater strength and lighter weight.
g) **Rubber grips** – Shall allow for easy and firmer grip for user safety.
h) **Handles closer together** – To offer more cutting power with less strain.

4.2.2.6. The Fig. 2 below illustrates the cutter described in this specification with replacement jaws and the cutting blade pattern. Table 2 gives the physical characteristics of various sizes.

Table 2: Hand operated manual wire cable cutter

Length of the tool		Soft and medium hard materials (Up to HRC 31)		Hard materials up to HRC 48		Approximate weight
inch	mm	inch	mm	inch	mm	kg
24	610	7/8	11	5/6	8	3
36	914	9/16	14	7/16	11	6
42	1047	11/16	18	1/2	13	8

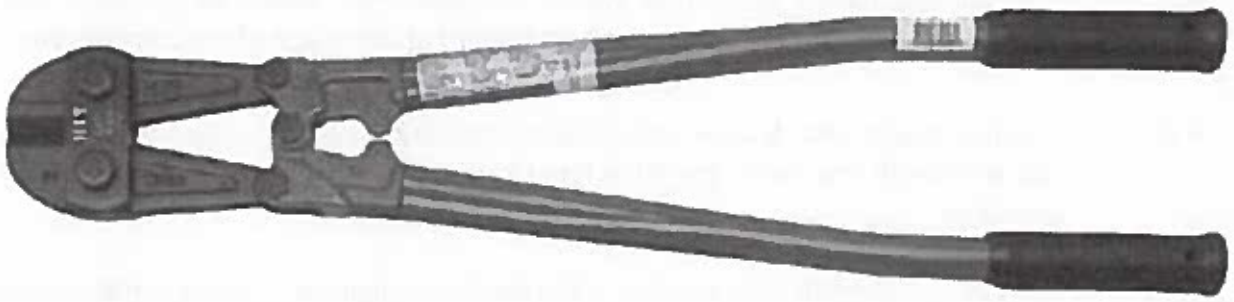

Fig. 2a: Heavy Duty Center Cut Cutters



Fig. 2b: Replacement Cutter Head

Fig. 2b: Replacement Black Jaws



Fig. 2c. Centre cut pattern

4.2.3. **Hand operated hydraulic compression tool**

4.2.3.1. **General**

4.2.3.2. The hand operated hydraulic crimping tool design and manufacture shall conform to the requirements of ISO 9461 and ISO 10763 standard requirements and those of this specifications.

4.2.3.2.1. The hydraulic crimping tools shall be lightweight and compact for the crimping and compression of low and high voltage cable lugs, splices and connectors.

4.2.3.2.2. The tools shall be made of high grade steel and have rubber handle grips. All tools shall be black zinc oxide coated to help reduce corrosion with the crimping blades and dies made of alloy tool steel (grade AISI - D2).

4.2.3.3. **Hand compression tool up to 300mm^2**

4.2.3.3.1. The hydraulic crimping tool shall be ideal for installing crimp connectors to overhead line applications and accepts most semi-circular slotted dies common to 130kN tools.

4.2.3.3.2. The tool shall have a die release system, protected from accidental operation and a pressure release trigger, which can be operated at any stage of the compression

4.2.3.3.3. The tool design shall feature spring loaded handles allowing the die sets to be advanced with one hand - the other hand free to position the connector prior to crimping.

4.2.3.3.4. For ease of operation and comfort of the electrical engineer or cable jointer the crimp tool head can be fully rotated through 180 degrees.

4.2.3.3.5. The hydraulic crimping tool design shall also feature a built-in safety valves which by-pass the oil supply when the maximum pressure is reached.

4.2.3.3.6. The crimping tool shall have a twin speed operation and automatically switches from a rapid advancing speed of the ram to a slower more powerful crimping speed as the die sets close and compress onto the connector.

4.2.3.3.7. The hydraulic crimping tool shall have the following compression capability as per Table 2 :

Table 2: Compression tool capabilities

Sn. No	Type of connector	Compression tool type
1	LV Lugs	Up to 400mm^2
2	LV Splices	Up to 240mm^2
3	Insulated Terminals	Up to 240mm^2
4	HV Lugs	Up to 400mm^2
5	HV Splices	Up to 240mm^2
6	C Sleeve and C Tap Connectors	Up to 185mm^2.

4.2.3.3.8. The hydraulic crimping tool shall have the following features and shall be as per Fig. 3

a) Crimping Force - 120kN
b) Length - 488mm
c) Width - 138mm
d) Weight - 5.7kg



Fig. 3: Hand Operated Hydraulic Compression Tool of up to 300mm^2

4.2.3.4. **Hand compression tool up to 300 - 1000mm^2**

4.2.3.4.1. The compression tool shall be a double acting (hydraulically advancing and retracting the ram) 60 ton press with a fast ram retraction and elimination of the tool jamming.

4.2.3.4.2. The tool shall feature a four (4)-way valve to reroute the hydraulic path to the retracting chamber when retracting the ram,

4.2.3.4.3. It shall ensure that the ram retracts hydraulically and as a result, the possibility of connector jamming shall be eliminated and at the same time the ram shall be retracted much faster. The ram retracting time shall not be more than 1/3 of the spring return.

4.2.3.4.4. The tool shall use U-type dies used for 60 ton compressors with a maximum diameter of 60mm.

4.2.3.4.5. Engine driven hydraulic pumps, hand pump, foot pump and electrical pump are recommended to operate the tool. The pumps shall have a double acting mechanism.

4.2.3.4.6. The hydraulic crimping tool shall have the following compression capability as per Table 3 :

Table 3: Compression tool capabilities

Sn. No	Capability	Requirement
1	Ram stroke	38.5 mm
2	Oil volume required	303 cc
3	Force at die face	517 kN
4	Oil pressure	68.5 Mpa (10, 000 PSI)
5	Porting	¼" NPSM male & female couplers
6	Coupling	BI type coupler size 06 (3/8")
7	Tightening torque	34 Nm
7	Approximate size	260 (Dia) x 446 (H) mm with Ground stand

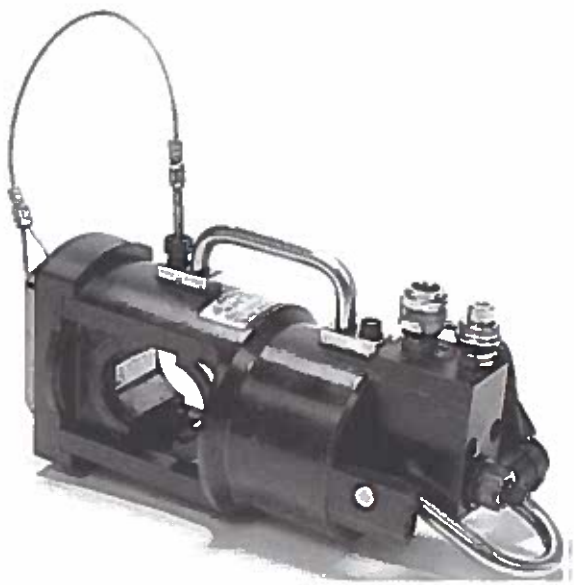

Fig. 3: Hand Operated Hydraulic Compression Tool of 400 - 1000mm^2

4.2.4. **Split Hydraulic Cable Jointing Tool Kit**

4.2.4.1. The equipment shall be used for compression of aluminium/copper lugs and connectors onto aluminium/copper conductors.

4.2.4.2. The equipment shall have facilities to enable it be fitted with hexagonal dies and shall have positive push button die locks.

4.2.4.3. The swivelling head shall be able to turn a whole 360° to allow use in confined places.

4.2.4.4. The equipment shall be used outdoor and indoor under all weather conditions.

4.2.4.5. The equipment shall be supplied with a full range of dies for cable lugs & fittings (LV/HV), overhead line connectors & fittings including ABC cable fittings covering the range 150 – 630mm^2.

4.2.4.6. The oil pipe coupler shall be fitted with size 06 (3/8") thread.

4.2.4.7. The compression equipment shall be connected with hydraulic pump with maximum working pressure of 700kgf/cm^2. The hydraulic pump shall be manually operated.

4.2.4.8. It shall include the hydraulic press heads, handles and shall be complete and ready for use.

4.2.4.9. The hydraulic compression tool shall have the following as a summary of its technical specifications as in Table 4:

Table 4: Jointing Kit technical data

Item	Technical Data
Output	120 kN
Maximum weight	11kg
Swivel head	360°
Pump delivery pressure	35T
Hexagonal die range	150 to 630mm ^{2} Cu - Al

4.2.5. Cable Peeling and Stripping Tool

4.2.5.1. This shall be one tool, performing the following four operations:

a) Stripping of sheathing material,
b) Peeling of outer bonded semicon,
c) Stripping of main insulation,
d) Chamfering of main insulation,
e) Cutting a slot into the insulation.

4.2.5.2. This tool shall be suitable for preparing cables in the field, before mounting joints and terminations. The tool shall be used for creating a smooth surface on the insulation and for the transition between insulation and the semicon. It shall have the following technical data:

a) Range of cable diameter (mm): **1.5-50**
b) Weight of tool (kg): **1.2**
c) Maximum peeling depth (mm): **1.5**
d) Minimum length of semicon (mm): **25**
e) Cutting depth for insulation (mm): **0..10**

4.2.5.3. During the peeling of bonded semicon:

a) The peeling depth shall easily be adjusted by the fine adjustment screw. As the peeling knife is firmly fixed to one of the rollers running on the surface of the cable, the knife shall follows exactly the contour of the cable, even if it is not completely round.
b) The feed for the peeling process shall be built into the guiding rollers. The knife shall have a special shape to provide a very smooth surface on the insulation.
c) The transition between insulation and semicon shall be designed to make an angle of some 10 degrees to provide for a perfect fit for slip on terminations and joints without any polishing rework.

4.2.5.4. The stripping of insulation and outer sheathing shall have the following features:

a) The tool has a knife with adjustable cutting angle used for stripping the insulation with a cutting angle which sets the fed for the stripping process.
b) The knife shall have a special shape of the cutting that allows a gap of about 1 mm to be left between the conductor and the bottom of the knife. This shall enable

the insulation material and the inner semicon, to be lifted off the conductor while cutting all the way through.

c) The tool shall finish the cutting process when the desired length is reached, the feed shall automatically reset to zero. The end result shall be a circular cut, allowing the pulling off of the helical shaped strip of insulation.

4.2.5.5. The chamfering of insulation shall require that:

The same knife used for peeling of the semicon shall be used with a chamfering angle of about 30 degrees to the cable axis.

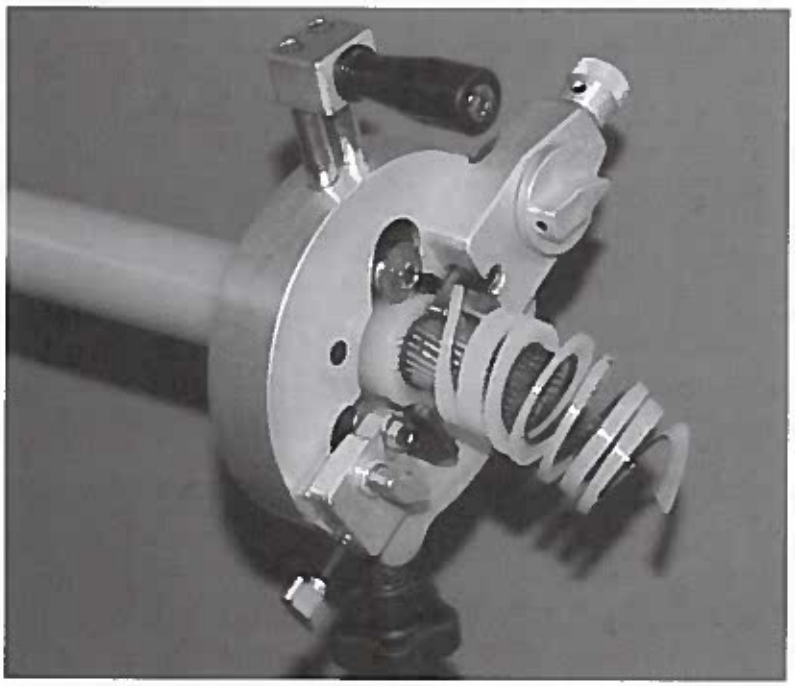

Fig. 4: Cable Peeling and Stripping Tool

4.3. QUALITY MANAGEMENT SYSTEM

4.3.1. 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 of the h hand-operated cutting, compression, peeling and jointing tools 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.

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

4.3.3. The bidder shall indicate the delivery time of the hand-operated cutting, compression, peeling and jointing tools, manufacturer's monthly & annual production capacity and experience in the production of the type and size of items being offered.

5.0. TESTS AND INSPECTION

5.1. The hand-operated cutting, compression, peeling and jointing tools shall be inspected and tested in accordance with the requirements of the standards and all the provisions of this specification. It shall be the responsibility of the supplier to perform or to have performed the tests specified and whatever other tests he normally performs at works.

5.2. Copies of previous Type Tests 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. The accreditation certificate to ISO/IEC 17025 for the same third party testing laboratory used shall also be submitted with the tender document (all in English Language)

5.3. The hand-operated cutting, compression, peeling and jointing tools shall be subject to acceptance tests at the manufacturer's works before dispatch. Acceptance tests shall be witnessed by two Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC). Routine and Sample Test Reports for the hand-operated cutting, compression, peeling and jointing tools to be supplied shall be submitted to KPLC for approval before delivery of the goods.

5.4. On receipt of the product, KPLC will perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC the hand-operated cutting, compression, peeling and jointing tools which upon examination, test or use; fail to meet any of the requirements in the specification.

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6.0. MARKING AND PACKING

6.1. MARKINGS

The hand-operated cutting, compression, peeling and jointing tools shall be clearly, legibly and indelibly marked with the following information either by embossing or inscription:

a) The manufacturer's 'initials or recognized trade-mark or both;
b) The year of manufacture
c) Designation of the tool,
d) Range of wires and cables applicable for each tool
e) Rated pressure in case of hydraulic tools;
f) Words "**PROPERTY OF KPLC**"

NOTE:

a) Where lack of available space would result in lettering too small to be legible, information may be provided on supplementary literature such as instruction/maintenance sheets, catalogue sheets or accessory tags.
b) Optional information that can be given either on the component or in supplementary literature shall also be provided in the instruction sheet.

6.2. PACKAGING

6.2.1. Each hand-operated cutting, compression, peeling and jointing tool shall be packed in a rubberized ergonomic case with a handle at balance point making the tool much easier to carry in a manner so as to avoid damage during transportation and storage.

6.2.2. The following information shall be printed on a suitable label firmly attached to each packaging or embossed on the body of the case:

a) Purchase order number/tender
b) Manufacturer's name
c) Year of manufacture
d) Tool catalog or designation number
e) The words, "**PROPERTY OF KENYA POWER & LIGHTING CO.**

7. DOCUMENTATION

7.1 The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:

a) Guaranteed Technical Particulars signed by the manufacturer;
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 9001:2008 certificate and other technical documents required in the tender.

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

a) Guaranteed Technical Particulars signed by the manufacturer;
b) Design Drawings with details of the hand-operated cutting, compression, peeling and jointing 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 9001:2008
d) Detailed test program to be used during factory testing;
e) Marking details and method to be used in marking the hand-operated cutting, compression, peeling and jointing tools;
f) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the hand-operated cutting, compression, peeling and jointing tools for The Kenya Power & Lighting Company;
g) Packaging details (including packaging materials).

7.3 The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the hand-operated cutting, compression, peeling and jointing tools to KPLC stores.

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ANNEX A: Guaranteed Technical Particulars *(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, four customer reference letters, details of manufacturing capacity, the manufacturer's experience and copies of complete type test reports for tender evaluation, all in English Language)*

Tender No. .....

Clause number	**Bidder's offer** (Bidder's offer (indicate full details of the offered tool for each requirement of the specification)
Bidder's Name	
Manufacturer's Name, address and country	
Type reference/model number of item(s) offered	
Scope: 1.1	
1.2 : Hand-operated conductor preparation tools	
a) Hand operated hydraulic wire cutter (24" & 36")	
b) Hand operated wire cutter (24" & 36")	
c) Hand operated hydraulic compression tool (up to 300mm^2)	
d) Split hydraulic cable jointing tool kit (150-630mm^2)	
e) Cable peeling and stripping tool	
2.0 Applicable Standards (References)	
3.0 Terms & definitions	
4.0 Requirements	
4.1 Service conditions	
4.2 Particular requirements	
4.2.1 Hand operated hydraulic wire cutter (24" & 36")	
4.2.1.1. - 4.2.1.6.	
4.2.2 Hand operated wire cutter (24" & 36")	
4.2.2.1 – 4.2.2.6	
4.2.3 Hand operated hydraulic compression tool (up to 300mm^2)	
4.2.3.1 - 4.2.3.9	
4.2.4 Split hydraulic cable jointing tool kit (150-630mm^2)	
4.2.4.1 - 4.2.4.1	
4.2.5 Cable peeling and stripping tool	
4.2.5.1 - 4.2.5.4 (a-h)	

Quality Management System	
Quality Assurance Plan	
Copy of ISO 9001:2008 Certificate	
Manufacturer's experience	
Manufacturing Capacity (units per month)	
List of previous customers	
Customer reference letters	
Test standards and responsibility of carrying out tests	
Copies of Type Test Reports submitted with tender	
Acceptance tests to be witnessed by KPLC at factory before shipment	
Test reports to be submitted by supplier to KPLC for approval before shipment	
Replacement of rejected tools	
Marking	
Packing	
Documents submitted with tender	
Documents to be submitted by supplier to KPLC for approval before manufacture	
Statement of compliance to specification	

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Manufacturer's Name, Signature, Stamp and Date