



Kenya Power

TITLE:

**SPECIFICATION FOR LOW
VOLTAGE TESTER (DETECTOR)
(1,000 V AC and 1,200 V DC)**

Doc. No.	KP1/3CB/TSP/09/0068
Issue No.	1
Revision No.	0
Date of Issue	2014-10-10
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Authorized by: Chief Engineer, Tech Stds & Specs

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0.1 Circulation List

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0.2 Amendment Record

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FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with Network Management Division, both of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for low voltage tester (detector) for use on low voltage distribution lines rated 1,000 V AC and 1,200 V DC. It is intended for use by KPLC in purchasing the tester.

1. SCOPE

- 1.1 This specification is for low voltage tester (detector) for use on low voltage distribution lines rated up to 1,000 V AC / 1,200 V DC.
- 1.2 The specification also covers inspection and tests of the low voltage tester (detector) as well as schedule of Guaranteed Technical Particulars to be fully filled, signed by the manufacturer and submitted for tender evaluation.
- 1.3 The specification stipulates the minimum requirements for low voltage tester (detector) acceptable for use in the company and it shall be the responsibility of the Supplier & Manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the low voltage tester (detector) for KPLC.

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:

- IEC 61243: Live working – Voltage detectors. Part 3:Two-pole low-voltage type
- IEC 601010: Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
- IEC 61326: Electrical equipment for measurement, control and laboratory use - EMC requirements.
- IEC 60801: Electromagnetic compatibility for industrial-process measurement and control equipment – Part 2: Electrostatic discharge requirements
- IEC 60068: Environmental testing

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IEC 60529: Degrees of protection provided by enclosures (IP Code)

VDE 0682: Live working - Voltage detectors - Part 401: Two-pole low-voltage type

OIML D 11: General Requirements for Measuring Instruments - Environmental Conditions

3. TERMS AND DEFINITIONS

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

4. REQUIREMENTS

4.1. Service Conditions

4.1.1. Physical conditions

The low voltage tester (detector) 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%
- c) Average ambient temperature of +30°C, with a minimum of -1°C and a maximum of +40°C.
- d) Altitude of up to 2000m above sea level

4.2. Safety and environmental requirements

4.2.1. The low voltage tester (detector) shall be designed and manufactured in accordance with IEC 601010-1 and OIML D 11 standard such that:

- a) Their errors do not exceed the maximum permissible errors under rated operating conditions.
- b) When they are exposed to disturbances, either:
 - (i) Significant faults shall not occur, or
 - (ii) Significant faults shall be detected and corrected by means of inbuilt checking facility.

4.2.2. The low voltage tester powered by a battery (stand-alone, rechargeable auxiliary or back-up batteries) shall have the type (-s) and capacity (-ies) of the batteries allowed to be used in the applicable measuring instruments specified by the manufacturer.

4.2.3. The low voltage tester shall be constructed in such a way that possibilities for unintentional, accidental, or intentional misuse are minimal.

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- 4.2.4. Software controlled low voltage tester that are complex in their functionality shall require that the user is guided for the correct use and for achieving correct measurement results.
- 4.2.5. The manufacturer shall specify the limiting conditions; storage and transport conditions for each specified influence quantity - quantity which is not the subject of the measurement and whose change affects the relationship between the indication and the result of the measurement.
- 4.2.6. The low voltage tester shall have a valid calibration status prior to being confirmed, within a specified metrological requirement.
- 4.2.7. The low voltage tester shall also be designed manufactured and tested in conformity with the following safety and environmental design requirements and standards as per Table 1;

Table 1: Safety and Environmental Design Requirements

No	Particulars	Test Performance	
1	Environmental conditions	Operating temperature	-10 ° C up to +55 C (climate category N)
		Storage temperature	- 5 ... +60 °C
		Humidity range - Rel. humidity	20 % up to 96 % (climate category N) non-condensing
		Altitude	Up to 2200m above sea level.
		Shock (operating)	15 g / 11 ms half sine as per IEC 60068-2-27
		Vibration (operating)	IEC 60068-2-6: Test Fc (Test level 2) Frequency range from 10 Hz to 150 Hz, continuous acceleration 2 g (20 m/s ²), 20 cycles per axis
		Dry heat test	IEC 60068-2-2: Type A test (Test level 2) Temperature - 55°C ± 2°C Duration of exposure – 2 h
		Damp heat test	IEC 60068-2-30: Test Db Test level 2 Temperature - 55°C ± 2°C Relative humidity – 93 % Duration of exposure – 4 h
2	EMC tests	Emission standards for residential, commercial and light-industrial environments	IEC 61000-6-3 - Class A
		Electrostatic discharge requirements	IEC 61000-4-2 – Test level 3 Air discharge - 8kV, Contact discharge - 6kV
		Rated Impulse Voltage for equipment -1.2/50µs	6000 V as per IEC 60664-1, table 1
		Overtoltage category	Class IV 1,000 V as per IEC 61010-1

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No	Particulars	Test Performance
3	Pollution category	Degree 2 as per IEC 60664-1 clause 2.5.1
	Insulation material group	Group II - $400 \leq CTI < 600$ (PLC=1) as per IEC 60112 and IEC 60664-1 clause 2.7.1
	Minimum clearances for equipment to withstand steady state voltages, temporary over-voltages and to avoid partial discharge	5.5mm as per IEC 60664-1 section 3, clause 3.1 and Table 1
	Partial discharge requirements	As per IEC 60664-1 Annex C
	Solid insulation design	Shall withstand short term and long term stresses as per IEC 60664-1 clause 3.3

NOTE: The tests results shall be as per the Performance Criteria A specified in IEC 61326-1 for the respective tests

4.3. Design and construction

4.3.1. Functional requirements

- 4.3.1.1. The low voltage tester shall be a two-pole type voltage tester according to IEC 61243-3 with a digital visual display and without own power supply.
- 4.3.1.2. The low voltage tester shall be designed for DC and AC voltage tests within the voltage range of 0 V up to AC 1,000 V / DC 1,200 V. It shall also be used to perform polarity tests in DC.
- 4.3.1.3. It shall provide precise display voltage of up to 1200 V, resistance/continuity of up to 6 MΩ and frequency of 15 - 10000 Hz.
- 4.3.1.4. The low voltage tester shall consist of the test probes clearly marked - L1 (+ve) and L2 (-ve) and a connecting cable; the test probe L1 shall be equipped with a digital visual display. Both test probes shall be provided with push buttons.
- 4.3.1.5. The digital visual display system shall consists of the following:
 - a) Red LEDs for indication of voltage/phase/phase sequence for voltages 0V, 240V, 415V and additional red LED-triangle for phase and phase sequence.
 - b) LCD 3½-digit or higher rating for voltage measurement and type of voltage (AC or DC); and for kΩ measurements, buzzer signal, ≤ 10 kΩ.
 - c) Green LED for continuity up to 5,999kΩ and diodes.

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4.3.1.6. To prevent excessive warming of the voltage tester, it shall be equipped with a thermal protection feature.

4.3.2. Operating Voltage Range and Electrical Characteristics

4.3.2.1. The low voltage tester shall be used only within the nominal voltage ranges of 0 V up to AC 1000 V/ DC 1200 V and shall never be connected to a voltage for longer than 30 seconds (maximum permissible operating time = 30 s) as per IEC 61243-3 clause 4.2.6.

4.3.2.2. Voltage checks shall be possible by means of known voltage sources such as:
a) For DC voltage tests use e.g. a car battery.
b) For AC voltage tests use e.g. a 240 V socket.

NOTE: *Voltage tester shall not be used unless all functions are operating correctly*

4.3.2.3. The voltage tester shall be applicable for the following functions and the manufacturer shall be required to submit with the tender a detailed operation procedures for all the functionalities:

- a) Direct and alternating current and voltage tests
- b) Resistance / continuity / diodes tests
- c) Polarity checks
- d) Phase / Phase sequence (earthed) tests
- e) Phase sequence (ungrounded)
- f) Frequency tests.

4.3.3. Indication

The low voltage tester shall provide:

- a) Clear perceptibility under normal light, at night, in all weather conditions, and in high ambient noise conditions from a distance of at least 3 m from the user.
- b) Clear perceptibility when held with the electrode pointing to the sun, i.e. glare shall not prevent a person from reading the indicator.
- c) Clear indication of the state "voltage present" and/or "voltage not present" as per IEC 61243-1 section 4.1.2 and 4.2.1.
- d) The tester shall have both visual and audible indications (Group I) as per IEC 61243-1 section 4.2.2.
- e) The tester shall have digital voltage readout between 0 and 1,000V AC /1,200V DC.
- f) An audible alarm shall be initiated when the detected voltage is greater than 0V.
- g) Low Battery warning indication when incorporating a built-in power source
- h) A Sleep Mode function when incorporating a built-in power source.

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4.3.4. Self-testing Facility

- 4.3.4.1. Self-testing facilities shall be provided to ensure that the voltage tester functions properly before and immediately after each voltage detection as per IEC 61243-3 section 4.2.8.
- 4.3.4.2. It is preferred that an "in-built" self-testing function is utilised and shall verify that:
- The contact electrode and contact electrode extension if applicable are tested for continuity,
 - "Live" indications provided by the detector are activated and proved to be working.

Table 2: Technical data for a two-pole voltage and continuity tester

Particulars		Requirements
Protection class		IP 65 IEC 60529 also for outdoor use
Nominal voltage range		8 V to AC 1000 V/ DC 1200 V (according to VDE 0682 part 401) : automatic switch on/change over at ≥ 8 V)
Input resistance		311k Ω , protective resistors directly behind both test probes
Current consumption for measuring circuit		3.2 mA at 1000 V
Nominal frequency range f		0 to 60 Hz
Maximum permissible operating time		ED = 30 s (max. 30 seconds); 240 s pause
Measurement ranges	Voltage	Manufacturer to state
	Resistance	Manufacturer to state
	Frequency	Manufacturer to state
Surge voltage strength		> 12kV case insulation to user
Surge voltage category		CAT IV 1000 V in accordance with IEC 60664-1
Power supply		9 V-block IEC 6 F22 or 6 LR61 Energy saving circuit, automatic switch-off after 30 s when no measurement is taken. Automatic indication when battery change is required
Connection lead		Rubber hose, H 07 RNF, highly flexible, 1 m
Approximate dimensions/weight		240 x 62 x 39 mm (device with display) 270 g (incl. battery)

4.3.5. Features and accessories

The low voltage tester shall be supplied complete with the following features and accessories:

- Extension for reaching test objects that are difficult to access and for tests on overhead lines of approximately 8m,
- Adapter for all test leads with 4 mm norm plug,

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- c) Test prods for voltages up to 5000 V,
- d) Impact-resistant plastic housing and break-proof display cover,
- e) Spring-mounted test contacts
- f) Twin-insulated rubber hose
- g) Bags and sheath

4.4. Quality Management System

- 4.4.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the low voltage tester (detector) design, physical properties, tests 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.
- 4.4.2. 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.
- 4.4.3. The bidder shall indicate the delivery time of the items, 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 low voltage tester (detector) 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.

5.0. TESTS AND INSPECTION

- 5.1. The low voltage tester (detector) shall be inspected and tested in accordance with the requirements of IEC 61243-3, IEC 61010-1, IEC 60664- 1 & 3, IEC 61326, IEC 60112, IEC 60068, IEC 61000, IEC 60965 and IEC 60529 standards. 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. Copies of type test reports to be submitted with the tender (by bidder) for evaluation shall be as stated below:
 - a) Dry and damp heat test.

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- b) Test of electric strength.
 - c) Test of operating current.
 - d) Test of leakage current on indoor type/ outdoor type detectors.
 - e) Test of surge voltage strength.
 - f) Testing for safety in the event of mistaking the voltage of the network.
 - g) Test of function of switches.
 - h) Test of built-in testing elements.
 - i) Test of radio interference suppression.
 - j) Test of heat resistance of insulating parts.
 - k) Test of over-temperature of handles and enclosures.
 - l) Impact hammer test.
 - m) Test of drop resistance.
 - n) Vibration resistance.
 - o) Flexing test.
 - p) Tensile test.
 - q) Pull relief test.
 - r) Test of the close adhesion of the detachable insulation of the electrode insulation.
 - s) Test of degree of protection by enclosure.
- 5.4. Routine and sample test reports for the low voltage tester (detector) to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC Engineers will witness tests at the factory before shipment.
- 5.5. On receipt of the goods 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 test unit which upon examination, test or use; fail to meet any of the requirements in the specification.
- 5.6. Tests to be witnessed at the factory before shipment shall be in accordance with IEC 61243-3, IEC 60664- 1 & 3 and IEC 60529 standards and this specification and shall include the following:
- a) Tests of construction, protection against contact, current limiting resistance, battery box, marking, instructions for use, and circuit diagram.
 - b) Test of clear indication and perceptibility.
 - c) Test of electric strength.
 - d) Test of operating current.
 - e) Test of leakage current on indoor type/outdoor type detectors.
 - f) Test of surge voltage strength.
 - g) Testing for safety in the event of mistaking the voltage of the network.
 - h) Test of function of switches.
 - i) Test of built-in testing elements.

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- j) Test of heat resistance of insulating parts.
- k) Test of over-temperature of handles and enclosures.
- l) Test of the close adhesion of the detachable insulation of the electrode insulation.

6.0. MARKING AND PACKING

6.1. MARKING

6.1.1. The low voltage tester (detector) shall be marked with international electric symbols and symbols for indication and operation if applicable with the following meaning:

Table 3: Symbols and meanings

Symbol	Meaning
	Device or equipment for working under voltage
	Push button
	Alternating current (AC)
	Direct current (DC)
	Direct and alternating current (DC and AC)
	Push button (manually actuated); indicates that respective indications only occur when both push buttons are actuated

6.1.2. The low voltage tester (detector) shall be marked in a permanent manner with the following information (in English Language):

- a) Product name and name of manufacturer
- b) Type of instrument (description of type, number and overall size of sections)
- c) Model: for indoor or outdoor use.
- d) Nominal voltage range of operation
- e) Explanation visual and audible indication
- f) Date for next periodic testing
- g) Year of construction and serial number
- h) Nominal frequency
- i) Standard to which the low voltage tester (detector) complies
- j) Indication of low voltage tester (detector) :
 - Group I: Indication with at least two distinct active signals, which give an indication of the condition "voltage present" and "no voltage present".
- k) Climatic conditions (usage and storage)

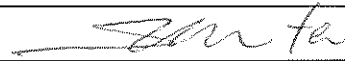
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- l) Indication of battery type or self-powering.
- m) Maximum permissible measurement limits
- n) The words "**Property of Kenya Power & Lighting Co**" shall be engraved permanently on each instrument while the other parameters shall be marked on a permanent label.
- o) The overvoltage protection category and duty rating e.g. category IV-field.

6.2. PACKING

6.2.1. The low voltage tester (detector) shall be carried in a sturdy tubular polyester bag case with two (2) black strap belts, one (1) shoulder strap; a lid with zipper and transparent pockets inside for instruction for use.

6.2.2. The accessories shall be packed in suitable matching bag with a shoulder carrying strap and a hand grip.

NOTE:

- a) *All equipment shall be suitably packed for protection against damage during loading, unloading, transport and storage.*
- b) *Parts subject to damage due to vibration shall be removed and separately packed if necessary.*

7.0. 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) Fully filled clause by clause description of the item on offer as per Annex A (Guaranteed Technical Particulars) and signed by the manufacturer;
 - b) Copies of the Manufacturer's catalogues, brochures, detailed design 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 relevant 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.
 - h) The manufacturer shall be required to also provide detailed information regarding the tester with the bid for evaluation:
 - (i) Maintenance Requirements
The supplier shall advise on the following requirements in relation to:
 - Before-use inspection.

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- Periodic maintenance and test including but not limited to the frequency and details of maintenance and test requirements of all components of the instruments and components such as the insulating stick, battery, etc. It is preferred that the battery be user replaceable without the need for special tools or re-calibration.

(ii) Essential Spares

The supplier shall advise the minimum quantity of essential spares to be kept by the purchaser (KPLC) to ensure repair of the low voltage tester (detector) can be carried out properly.

(iii) Instructions for Use

The supplier shall provide comprehensive instructions, drawings and information for use of the low voltage tester (detector) and their adaptors. As a minimum, the instructions shall address the following:

- Correct operation.
- Care and maintenance by the operator.
- Service, testing and repair.

Where the manufacturer's standard brochures and instructions do not meet this requirement, the supplier shall provide the necessary information as a supplement to that of the brochure

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

- Guaranteed Technical Particulars signed by the manufacturer;
- Design drawings with details of the low voltage tester (detector) to be manufactured for KPLC.
- 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
- Detailed test program to be used during factory testing;
- All documentation necessary for safety of the equipment as specified in IEC 61010-1 clause 5.4 shall be provided with the equipment.
- 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 low voltage tester (detector) for The Kenya Power & Lighting Company;

7.3 The supplier shall also submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the low voltage tester (detector) to KPLC stores.

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ANNEX A: *Guaranteed Technical Particulars (to be filled and signed by the supplier and submitted together with copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of test certificates for tender evaluation)*

Tender No Bidder's Name & Address

	Description	Bidder's Offer
1	Name of the manufacturer and country of origin	
	Type Reference Number or Model Number	
2	Applicable Standards	
3	Terms and Definitions	
4	Requirements	
4.1	Service conditions	
4.1.1	Physical conditions	
4.2	Safety and environmental requirements	
	4.2.1 – 4.2.7	

Safety and environmental design requirements

Operating temperature	-10 ° C up to +55 C (climate category N)	
Storage temperature	- 5 ... +60 °C	
Humidity range - Rel. humidity	20 % up to 96 % (climate category N) non-condensing	
Altitude	Up to 2200m above sea level.	
Shock (operating)	15 g / 11 ms half sine as per IEC 60068-2-27	
Vibration (operating)	IEC 60068-2-6: Test Fc (Test level 2) Frequency range from 10 Hz to 150 Hz, continuous acceleration 2 g (20 m/s ²), 20 cycles per axis	
Dry heat test	IEC 60068-2-2: Type A test (Test level 2) Temperature - 55°C ± 2°C Duration of exposure – 2 h	
Damp heat test	IEC 60068-2-30: Test Db Test level 2 Temperature - 55°C ± 2°C Relative humidity – 93 % Duration of exposure – 4 h	
Emission standards for residential, commercial and light-industrial environments	IEC 61000-6-3 - Class A	
Rated Impulse Voltage for equipment -1.2/50µs	6000 V as per IEC 60664-1, table 1	
Overvoltage category	Class IV 1,000 V as per IEC 61010-1	
Pollution category	Degree 2 as per IEC 60664-1 clause 2.5.1	
Insulation material group	Group II - 400≤CTI<600 (PLC=1) as per IEC	

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Kenya Power

TITLE:

**SPECIFICATION FOR LOW VOLTAGE TESTER (DETECTOR)
(1,000 V AC and 1,200 V DC)**

Doc. No.	KP1/3CB/TSP/09/0068
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		60112 and IEC 60664-1 clause 2.7.1	
	Minimum clearances for equipment to withstand steady state voltages, temporary over-voltages and to avoid partial discharge	5.5mm as per IEC 60664-1 section 3, clause 3.1 and Table 1	
	Partial discharge requirements	As per IEC 60664-1 Annex C	
	Solid insulation design	Shall withstand short term and long term stresses as per IEC 60664-1 clause 3.3	
4.3	Design and construction		
4.3.1	Functional requirements		
	Type	Two-pole	
	Voltage range	0 – 1,000 V AC / 1,200 V DC	
	Display	Voltage	Up to 1,200 V
		Resistance	6 MΩ
		Frequency	15 – 10 MHz
	Test probe markings	L1 (+ve) ; L2 (-ve)	
	Digital visual display system	Red LED for voltage/phase/phase sequence	
		LCD 3 ½ digit display	
		Green LED	
	Thermal protection feature	Y/N	
4.3.2	Operating voltage range & electrical characteristics		
	Maximum permissible voltage	30 seconds	
	Voltage check features	Car battery for DC and 240V sockets for AC	
	Functionalities	Direct and alternating current and voltage tests	
		Resistance / continuity / diodes tests	
		Polarity checks	
		Phase / Phase sequence (earthed) tests	
		Phase sequence (ungrounded)	
		Frequency tests	
4.3.3	Indication		
	Clear perceptibility	Under normal light, at night, in all weather conditions, and in high ambient noise conditions from a distance of at least 3 m from the user.	
		When held with the electrode pointing to the sun, i.e. glare shall not prevent a person from reading the indicator.	
	Clear indication of the state	"Voltage present" and/or "voltage not present" as per IEC 61243-1 section 4.1.2 and 4.2.1.	
	Indication group	Group 1	

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	Voltage readout	Digital voltage readout between 0 and Un max V AC/DC	
	Low battery warning	indication when incorporating a built-in power source	
	Sleep mode functions	Indication when incorporating a built-in power source	
4.3.4	Self-Testing Facility		
	Self-testing facilities	To ensure that the voltage tester functions properly before and immediately after each voltage detection as per IEC 61243-3 section 4.2.8.	
	"In-built" self-testing function to verify that:	Contact electrode and contact electrode extension if applicable are tested for continuity	
		"Live" indications provided by the detector are activated and proved to be working.	
4.3.5	Features and accessories		
	a) Extension for reaching test objects that are difficult to access and for tests on overhead lines of 8m in length		
	b) Adapter for all test leads with 4 mm norm plug		
	c) Test prods for voltages up to 5000 V		
	d) Impact-resistant plastic housing and break-proof display cover		
	e) Spring-mounted test contacts		
	f) Twin-insulated rubber hose		
	g) Bags and sheath		
	Technical data for a two-pole voltage and continuity tester		
	Protection class	IP 65 IEC 60529 also for outdoor use	
	Nominal voltage range	8 V to AC 1000 V/ DC 1200 V (according to VDE 0682 part 401) : automatic switch on/change over at ≥ 8 V)	
	Input resistance	311k Ω , protective resistors directly behind both test probes	
	Current consumption for measuring circuit	3.2 mA at 1000 V	
	Nominal frequency range f	0 to 60 Hz	
	Maximum permissible operating time	ED = 30 s (max. 30 seconds); 240 s pause time	
	Surge voltage strength	> 12kV case insulation to user	
	Surge voltage category	CAT IV 1000 V in accordance with IEC 60664-1	
	Power supply	9 V-block IEC 6 F22 or 6 LR61 Energy saving circuit, automatic switch-off after 30s when no measurement is taken. Automatic indication when battery change is required	
	Connection lead	Rubber hose, H 07 RNF, highly flexible, 1 m	

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	Approximate dimensions/weight	240 x 62 x 39 mm (device with display) 270g (incl. battery)	
4.4	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		
5.1	Test standards and responsibility of carrying out tests		
5.2	Copies of Type Test Reports submitted with tender		
5.3	Acceptance tests to be witnessed by KPLC at factory before shipment		
5.4	Test reports and calibration certificates to be submitted by supplier to KPLC for approval before shipment		
5.5	Replacement of rejected low voltage testers		
5.6	Tests to be witnessed at the factory before shipment		
6.1	Marking		
6.2	Packing		
7.1	Documents submitted with tender		
7.2	Documents to be submitted by supplier to KPLC for approval before manufacture		
8.0	Statement of compliance to specification		

.....
Manufacturer's Name, Signature, Stamp and Date

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