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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Procurement Manager
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0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)

FOREWORD

This specification has been prepared by the Research and Development Department and E/Plant, Mt. Kenya office both of The Kenya Power and Lighting Company Limited (Kenya Power) and it lays down requirements for fully automated Digital Circuit Breaker Analyzer. The specification is intended for use by Kenya Power in purchasing the equipment.

It shall be the responsibility of the supplier to ensure adequacy of the design and good engineering practice in the manufacture of the Digital Circuit Breaker Analyzer for Kenya Power. The supplier shall also submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

1. SCOPE

This specification is for a microcomputer-controlled, intelligent, fully automated (digital) Circuit Breaker Analyzer. Detailed requirements are contained in this specification.

2. REFERENCES

N/A

3. TERMS AND DEFINITIONS

N/A

4. REQUIREMENTS

4.1 GENERAL REQUIREMENTS

The Circuit Breaker Analyzer shall be manufactured and tested to all applicable and relevant international standards including IEC and ISO standards.

The equipment shall be used for complete field analysis of Medium and High Voltage Circuit breakers, to ascertain their condition and integrity after installation and before Commissioning.

The field tests are essential after circuit breaker installation in detecting damaged and Slow-Closing breaker poles.

The synchronism of the circuit breaker poles during closing and opening shall be monitored to ensure that the three poles operate at the same time.

The instrument shall also automatically measure the contact resistance of the Breaker's three poles.

The Analyzer shall ensure complete field analysis and diagnosing of the circuit breaker in the shortest time possible.

4.1.1Construction

4.1.1.1 The equipment shall be portable; rugged, light weight, shock proof and suitable for use in harsh field conditions.

4.1.1.2 The analyzer shall be fully automated, intelligent and of high accuracy.

4.1.1.3 It shall be self calibrating and diagnosing, no internal circuitry setup required.

4.1.1.4 The power supply shall be from an internal 12Vdc rechargeable Nickel-Cadmium battery or 240V ac 50 Hz.

4.1.2Operation

4.1.2.1The Circuit breaker Analyzer shall be standalone or if laptop controlled, the Laptop complete with accessories shall be supplied with the equipment.

4.1.2.2 Its operating system shall be run on Microsoft windows7 professional edition, capable of being integrated with other diagnostic and data management software.

4.1.2.3The accuracy of the test results shall not be depended on the quality of the input signal. It shall have in built system for automatic suppression of Electrostatic & electromagnetic interference in power substations.

4.1.2.4 All operating commands shall be by key pad, touch screen, remote laptop or push button, no panel switches.

4.1 2.5 The analyzer sampling frequency shall be within the maximum range that can be attained with the technology now available in the market.

4.1.2.6 The analyzer shall be capable of measuring at least three poles of a circuit breaker/ Closers in three phase power system.

4.1.2.7 The equipment shall have automatic test procedures that are easy and simple to use.

4.1.2.8 It shall be supplied with most recent software for easy operation and data analysis.

4.1. 3 Test results

4.1.3.1The Circuit breaker analyzer shall generate test results automatically and display on a back light LCD Screen or laptop via communication serial port.

4.1.3.2The analyzer shall have built-in storage and downloading capabilities via USB Port and RS-232C interface.

4.1.3.3 The analyzer shall be capable of printing the test result by use of in-built printer or external printer via communication interface.

4.1.3.4 The analyzer shall display the test results both in alphanumeric and graphically.

4.2 TECHNICAL AND SPECIFIC REQUIREMENTS

4.2.1 Specific requirements

4.2.1.1The digital circuit breaker analyzer shall be capable of automatically carrying out following field tests on Circuit breakers and Closers.

I) Automatically and simultaneously measure the opening and Closing time of the three main poles (contacts) and two auxiliary contacts of Circuit Breakers/Closers with up to three separate mechanisms.

ii) Automatically and simultaneously measure the three main Contact (Open/Close) resistance of the breaker poles at a regulated current of up to 10Adc.

iii) Measure main and insertion resistance contacts on the same input simultaneously.

iv) Initiate circuit Breaker tripping /Closing whose coils are rated between 30-250Vac/dc.

v) Shall have breaker initiate capacity of up to 25A/250Vac/dc.

vi) Determine the maximum coil currents, (opening and closing).

vii) Evaluate the synchronism between the circuit breaker poles during closing and opening.

viii) Measuring / analyzing and display the following breaker performance parameters;
- Velocity
- Over-travel

- Contact wipe and time spread of main and resist resistive contacts.
- Dynamic resistance

4.2.1.2 The Circuit breaker poles contact motion analysis shall include: Open,Close,Open-Close, Close-Open, and Open-Close-Open.

4.2.1.3 The equipment shall display graphical and statistical representations of the computed results where possible. It shall also automatically carry out all the unit conversions.

4.2.2 Testing Capability.

The circuit breaker analyzer shall be capable of testing following power utility Circuit Breakers:-

- Extra High Voltage (EHV) Circuit breakers, /Closers with up to three separate mechanisms each having at least three poles (Contact Elements).
- Medium Voltage (Distribution)/ Reclosers with up to three separate mechanism each with at least three Contact Poles/Elements.
- High and Medium Voltage Dis-connectors

4.3 Technical Specifications

Item No.	Technical description	Kenya Power Technical Requirements
1	**Physical features**	a) Portable, Compact and rugged. b) Standalone or laptop controlled
2	**Measurement circuitry**	a) Auto selectable, fully digital and intelligent.
3	**Main contact (Dry-Contact) timing inputs**	3 to 6 channels. Each channel measuring Main & Insertion-Resistor simultaneously.
4	**Timing measurements** Range Resolution Accuracy	 Selectable:100ms,200ms, 2000ms, and 10seconds, ±0.1ms at 100ms and ±0.5ms at 10 seconds ±0.05%.of reading.
5	**Graphic representation**	Shall have a resolution of at least 0.8ms per mm.

6	**Contact Resistance measurement.** Range Resolution Accuracy	 Automatic range selection from 0 to 1.00Ω(ohm) 0.1μohm ±0.25 % of reading
7	**Resistance Current measurement** Range Accuracy Resolution	 0 to 200A 1%. of reading 0.1A
8	**Trigger input voltage**	Open/Close:30-250Vdc or Peak ac
9	**Lap top**	➢ Minimum processor type i3-350 ➢ Minimum RAM 2GB ➢ Minimum HDD-500 GB ➢ Memory card slots ➢ HDMI slot ➢ VGA slot ➢ Ethernet both wired and wireless including capability for gigabit Ethernet ➢ USB slots ➢ RS-323 slot ➢ Microsoft windows 7 professional edition ➢ Bluetooth capability
10	**Breaker initiate capacity**	25A/250Vac/dc
11	**Breaker operation to be initiated**	Open, Close, Open-Close, Close-Open, and Open-Close-Open
12	**Auxiliary input** Input voltage range	 0-250Vdc or peak ac
13	**Coil current** Measuring range Trigger reaction time	 0-30A dc/ac <2μs
14	**Digital and Analog transducer inputs**	At least three analog and three digital
15	**Power supply**	230Vac / Rechargeable battery with normal operating time of 5 hours

16	**Display**	Back-lit LCD Screen / laptop via interface.
17	**Print out**	In-built thermal printer or via Laptop interface.
18	**Printer/ Computer interface**	RS-232C and USB port
19	**PC Software** **Features**	Most recent version of circuit breaker analysis Software running on Microsoft Windows 7professional. Graphic display, Numerical report and Data base utility.
20	**Test result storage**	Can store at least 50 timing records and 50 test plans
21	**Calibration**	Self calibration and diagnosing.
22	**Interference suppression**	Automatic suppression of electromagnetic interference in substations.
23	**Safety**	Meets: UL 6101A-1 Certification and CAN/CSA C22.2 No.1010.1-92 ,IEC1000-4-2 L4, IEC1000-4-3 L3 and IEC 1000-4-5
24	**Warranty on Equipment**	At least 12 months
25	**Analyzer operation**	Independent or remotely controlled by Laptop
26	**Operating temperature**	-5^0C to 50 ^{0}C;
27	**Humidity**	0 to 90%. Non-condensing
28	**Calibration certificate**	Certificate of accredited international laboratory
29	**Operation and Maintenance manual**	At least three manuals each in English language.
30	**Installation**	At KENYA POWER chosen location
31	**Theoretical and Practical training**	Two days Training at KENYA POWER site by Supplier's engineer, and Three days training at manufacturer's factory
32	**Factory Inspection**	Two KENYA POWER Engineers
33	**Accessories**	One set of :- i. 6 m Single phase Extension cable ii. 6 m Grounding Cable,

		iii. 3m USB cable iv. 3m RS-232C cable v. Carrying case. vi. 6m of all cables needed for all tests.

4.4 DOCUMENTATION AND SUPPORT

4.4.1 Warranty and training

4.4.1.1 The Digital Circuit Breaker shall be backed by a minimum 12-months factory warranty.

4.4.1.2 Two days training on the equipment shall be conducted at KENYA POWER site by Supplier's Engineer, or three days training for one Engineer and one Craft/Technician at manufacturer's factory. The Supplier and KENYA POWER shall meet the cost of this training.

4.4.1.3 Technical support and software upgrades where applicable, shall be provided free of charge to KENYA POWER for a period of not less than 36 months.

4.4.1.4 The Bidder shall submit a clause by clause statement of compliance with the specifications together with copies of the manufacturer's catalogues, brochures, technical data and proven test reports clearly marked to support each clause, all in English for evaluation. The manufacturer's type reference/designation of the item offered shall be indicated.

4.41.5 In the case of tender award, technical details for the Automated Circuit Breaker Analyzer shall be submitted to the KENYA POWER for approval before manufacture commences.

4.41.6 After tender award, factory inspection and certification by at least two KENYA POWER engineers shall be carried out before shipment of the Equipment.

5. TESTS AND INSPECTION

5.1 Copies of previous certificates by the relevant National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025 accredited laboratory) shall be submitted with the offer for evaluation (all in English Language).

5.2 Relevant certificates (calibration/test) shall be submitted together with the equipment during delivery.

6.0 MARKING AND INSTRUCTIONS

6.1 The following information shall be marked indelibly and legibly on the Digital Circuit Breaker Analyzer:

i) Manufacturer's Name or Trademark;
ii) Type reference
iii) Letters "PROPERTY OF KENYA POWER "
iv) Operating Voltage

6.2 Operating and technical manuals shall be supplied together with the equipment during delivery (all in English language).

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

Tender No. .....

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Manufacturer's Name, Signature, Stamp and Date