TECHNICAL SPECIFICATIONS OF LOT 1 (MEASURING EQUIPMENT)

Item No.	Item Description	Unit	Technical Specification	Sample Picture
1(1)	Digital laser distance meter	NO	Refer page **7|Technical Specification of Lot** 1 for detailed technical specification.	
1(2)	Micro-Ohm meter	NO	Refer page **8|Technical Specification of Lot** 1 for detailed technical specification.	
1(3)	Transformer turn ratio test meter, Battery-operated	NO	Portable, Digital, Three phase transformer turns Ratio tester (Automatic); high ratio measuring ranges, input voltage: single phase, 230-240VAC, 50Hz. along with communication software, with adequate inbuilt data storage memory system, report print out and download data to PC. TTR should also come along with complete set of all accessories like three phase shielded test leads, carrying bags, clips for test lead & bushing clips, cable for connecting TTR to PC, communication software, transformer vector diagram, instruction manuals, etc.	

Procurement Services Department ★ Bhutan Power Corporation Limited ★ Thimphu, Bhutan

1(4)	Taurus TFR measuring Instrument, TFR73 HF	SET	Refer page **9|Technical Specification of Lot** 1 for detailed technical specification and Guaranteed Technical Particular.	
1(5)	Optical Time Domain Reflectometer (OTDR)	NO	Refer page **13|Technical Specification of Lot** 1 for detailed technical specification	
1(6)	Live Fiber Identifier	NO	Refer page **14|Technical Specification of Lot** 1 for detailed technical specification	
1(7)	Insulation Resistance meter 50V to 5kV with multi range	NO	• Measure insulation of high-voltage equipment (such as transformers, cables and motors). Automatically calculate and display PI (Polarization Index) and DAR (Dielectric Absorption Ratio) • Step voltage testing, temperature compensation, temperature measurement, and leakage current display • Data storage and USB interface • Power supply: LR6 (AA)x6 or 95459 Battery Pack • Dimensions, mass: 260Wx250.6Hx119.5Dmm, 2.8 kg Accessories: • Test lead (1 No.) • Alligator clip (1 No.) • USB Cable (1 No.) • AC Adapter (1 No.) • Battery pack (1 No.).	

1(8)	Insulation Resistance meter 5kV to 10kV with multi range	NO	Insulation Tester Type: • Digital Megohmmeter • Insulation testing voltage: 250V, 1Kv • Insulation Testing Resistance: 2TOhm • Operating Temperature Range: -20 Degree Celsius to +50 Degree Celsius • External Height: 160mm • External Width: 269mm • External Depth: 277mm • Weight: 2.2lb • SVHC: No SVHC.	
1(9)	Digital clamp on meter	NO	Digital clamp on meter, Up to 600V AC (rms) / 600V DC (Auto ranging), 1mA – 1000 A (rms), Resistance: 0Ω-1MΩ Heavy duty with accessories.	
1(10)	Digital Phase sequence meter Protection CAT-III, 600V	NO	Digital Phase sequence meter (40 to 690V) with all Accessories. Protection CAT-III, 600 V. • Measurement range: 40 to 690V • Frequency: 15 to 400Hz • Input current: 1mA • Phase test current: 1mA • Operating conditions: 0 to 40 degree Celsius • Protection: IP40 • Testing cables with strong alligators clip: 3x130cr • Dimensions: 130x69x32 • Weight: 130 grams • Protection standards: IEC 61010/EN IEC 61667-7/EN	

1(11)	Digital Earth Resistance tester	NO	Digital Earth resistance test meter (1 Ω-200kΩ) with 4, 3 & 2 wires earth resistivity measurement using Wenner method with all necessary accessories	
1(12)	Earth Resistance Clamp Tester	NO	Digital earth resistance clamp tester along with complete accessories (Automatic), earth resistance range: (0.025-0.250 ohms, 0.250-9.999 ohms, 10-99.99 ohms, 100-199.9 ohms, 200-400 ohms, 400-600 ohms, 600-1500 ohms); AC current: 100mA- 30A, 50Hz, battery operated type: auto-range selection; response time: approx. 7 seconds for earth resistance & approx. 2 seconds for AC current measurement; Auto power-off features, digital LCD display, conductor size: 35mm (approx.), weight: approx. 780g.	
1(13)	Non-contact AC Voltage detector 50V - 1000V (tester)	NO	Dual Range Non-contact Voltage Tester: AC volt 80V to 7KV (50/60Hz) Audio signalling and light emitting Alkaline button cell battery 1.5V (LR44)x2 Pen type Auto power-off feature conserves and extends battery life Digitally controlled ON/OFF power button Microprocessor controlled low-battery indicator CAT IV 1000 Volt rating provides expanded operation and protection Lightweight, durable polycarbonate plastic resin construction with convenient pocket clip.	

1(14)	Voltage detector line tester up to 36kV	NO	Voltage band - 10-36KV Voltage presence indication - Red LED flashing (very bright and visible at more than 20m in direct lighting) Powerful rated audible signal - >60dB(A)/2rn Operating check - Pressing test button and correct operation is indicated with a red LED flashes on-sound signal **Characteristics** Detectors have unitary adjustments and are checked by routine test also dielectrically tested on substation bars Power supply - 1x9V alkaline battery type 6LR61. Contact electrodes fitted to the housing by screwing and are easily interchangeable. The detector should be fitted with telescopic insulation stick of not less than 7m able to with stand up to 36KV. **End fittings** K- Universal, for universal end fitting sticks Weight of the detector - 420 grams Size of detector - Dia 59x270mm	 
1(15)	HV Proximity Alarm, upper arm fitting 12kV, 70cm	NO	High Voltage Proximity Alarm & Personal Safety Voltage Detector: Distance of starting warning 80 cm from 11kV (6.6kV voltage to earth). Applicable frequency 50 Hz. Volume 70 db or higher at 1 meter distance, Battery life: 50 Hours for continuous use; Suitable for Arm Fittings or Around Helmets Fittings	

1(16)	Digital Multimeter	NO	Digital multimeter, Voltage ranges: 200mV-1000V AC/DC, 50Hz Current ranges: 200micro Amps -10Amps AC/DC, Resistance ranges: 0 - 20mega-ohms with diode test. CAT III. The Digital Multimeters must be supplied along with test and calibration certificates.	
1(17)	High Voltage Detector 33kV to 400kV	NO	Non-contact high voltage detector-SEW278HP with the following features: • Protection class: IP65, • 3 LED indicator in a circle for easier viewing (360 degree led indication), • 8 voltage setting: 11kV-400kV, • High bright LED visual indication, • Sound indication.	
1(18)	HV Proximity Alarm, 11kV to 220kV	NO	Wrist type high voltage alarm, Voltage level 132kV, Voltage range: 1kV-132KV, 50Hz, Alarm distance error ±10cm (23°C±1°C, 80%RH under basic conditions), Non-contact type.	

Technical Specification of Item No. 1(1): Digital laser distance meter

Parameter	Specification
Measurement Range	Distance:10-500m/11-550 yd./33-999 ft.(*999 ft.: 304.5m/333 yd.) Angle: ±89º
Distance Display	[Internal Display] Act (Actual Distance): every 0.5m/yd., 1.0 ft. (shorter than 100m/yd./ft.) every 1.0m/yd., 1.0 ft. (greater than 100m/yd./ft.) Hor (Horizontal Distance) and Hgt (Height): every 0.2m/yd., 0.5 ft. (shorter than 100m/yd./ft.) every 1.0m/yd., 1.0 ft. (greater than 100m/yd./ft.) Ang (Angle): every 0.1º (less than 10º) every 1.0º (more than 10º) *Downward angle from the horizontal line: with display "-" [External Display] Act (Actual Distance): every 0.5m/yd., 1.0 ft. Hor (Horizontal Distance) and Hgt (Height):every 0.2m/yd., 0.5 ft. Ang (Angle): every 0.1º
Magnification (x)	6
Effective object diameter (mm)	21
Actual Field of View (⁰)	6.0
Exit Pupil (mm)	3.5
Eye Relief (mm)	18.2
Dimensions (LxWxH) (mm)	130x69x45
Weight (g)	210
Power Source	CD2 lithium battery x 1 (DC3V) Auto power shutoff function equipped (after 30 sec.)
Safety and EMC	VCCI class B, Class 1M laser product (IEC60825-1:2001), Class 1 laser product (21CFR 1040.10 and 1040.11) CE, EMC directive, Fcc Part15 subpart B Class B, c-tick, WEEE

Technical Specification of Item No. 1(2): Micro-Ohm meter

Parameter	Specification
Measurement Types	Resistance Measurement: 0.000 mΩ (30 mΩ range) to 3.5 M Ω (3MΩ Range), 10 Ranges
	Temperature Measurement (thermistor): -10.0 to 99.9^{0}C
Measurement Method	4-terminal direct current (constant current), banana plug
Range Switching	Auto or Manual
Temperature Correction	Reference temperature setting range: -10^{0}C to 99.9^{0}C, Temperature Coefficient setting range: -9,999 ppm/^{0}C to +9,999 ppm/^{0}C
Zero-adjustment	Within +3% f.s. of each range. (f.s.=30,000 dgt)
Trigger	Internal Triggerl
Measurement Speed	Fixed
Functions	Temperature correction, temperature conversion, off-set voltage compensation (OVC), comparator (ABS/REF%), length conversion, judgement sound setting, auto hold, auto power save (APS)
Display refresh rate	Without OVC: approx.. 100ms, With OVC: approx.: 230ms
Memory Storage	Number of recordable data points: (Manual/ auto) Up to 1000, (interval) Up to 6000; interval: 0.2 to 10.0s (0.2s steps); Acquisition of data from memory: display, USB Mass Storage (CSV, TXT files)
Power Supply	LR6 (AA) Alkaline batteries x8, Continuous use: 10 hours (Under our company's conditions), Rated power consumption: 5VA
Application standards	Safety: EN61010 EMC: EN61326

Accessories	Quantity
Clip type lead	1 No
Temperature sensor	1 No
LR6 alkaline battery	8 Nos
Strap	1 No
Extra fuse	1 No

TECHNICAL SPECIFICATIONS OF TOWER FOOTING EARTH RESISTANCE, INDUCTANCE AND IMPEDANCE TESTER WITH GPS

Make: TAURUS,

Model: PREZIOHM-TFR 73HF

1. APPLICATION:

To measure the earth Resistance, Inductance and Impedance of a particular EHT transmission line tower, without having to remove the top earth wire. As per IEEE 81 Method.

2. SCOPE:

This specification covers the manufacturing, testing at site and supply of Tower Footing earth resistance, inductance and impedance Measurement Tester, capable of measuring Resistance, Impedance, and Inductance of the tower in ONLINE condition. This should virtually isolate the tower from the top ground wire which is being connected to all the towers.

3. WORKING PRINCIPLE

The equipment should be capable of using the widely accepted *3 Pole Fall of Potential method* for getting the accurate readings of the individual tower.

4. TEST FREQUENCY

Should be high frequency equipment. *Test Frequency should be 25KHz*

5. INDUCTION SUPPRESSION

The equipment should be able to work on EHV Towers upto 765kV AC and 800kV DC lines and there should not be any effect on the readings due to induction and leakage currents.

6. RANGE OF OPERATION

The maximum resistance & impedance reading which can be measured using the equipment shall be upto 2K Ohms.

7. ACCURACY

The system shall be accurate to ± 2 to 5% customized

8. GPS, DATE & TIME

The use of Global Positioning System should facilitate the user to exactly locate and identify the particular tower for which the reading has been taken. The GPS co-ordinates (Lat-Long,) along with date and time and the reading of the particular tower should be saved.

9. OUTPUT VOLTAGE

The equipment should have an output voltage of 250 Volts.

10. POWER SUPPLY

The equipment should comprise of inbuilt 12V 7AH rechargeable battery with advanced SMPS for long duration (min 6 hours) usage and also operate on mains with AC adapter.

11. EQUIPMENT OPERATION

Simple to operate with one touch operation; shall be automatic and portable.

12. RUGGED CONSTRUCTION

The instrument shall be highly rugged and 'tropicalised' construction to enable it to withstand rough field conditions. The cabinet shall be of solid copolymer polypropylene, with HV protection.

13. ENVIRONMENT CONDITION

The equipment should be capable of working in standard temperature, moisture & humidity. The cabinet shall be protected against dust, ingress of water and chemicals. The equipment shall be housed in IP 67 Peli casing. Transportation from location to another shall not affect the functioning of instrument

14. TYPE TESTS AND STANDARDS

The instrument shall confirm to relevant standards as per IEC.

IEC 61000-4-2:2001- Electrostatic discharge immunity

IEC 61000-4-3:2006 Radio Magnetic power frequency immunity

IEC 61000-4-8:2001 - Power frequency magnetic field immunity

IEC 60068-2-6 for vibration test

IEC 60068-2-27 for shock test

IEC 60068-2-78 for bump test

Ingress protection - IP 67

GUARANTEED TECHNICAL PARTICULARS FOR THE TOWER FOOTING EARTH RESISTANCE AND IMPEDANCE TESTER

SL#	Description	Technical Specifications	Bidders to fill in (Comply/NOT)
1	Functional Requirement	The equipment should be able to measure the impedance, resistance and inductance of the tower foot grounding without isolating the top earth wire, in	

		online condition. Instrument shall be immune to noise and induction	
2	Special Features	Portable, light weight, inbuilt rechargeable battery operated Automatic suppression of interference.	
3	Voltage Output	250 Volts	
4	Current output	The equipment should be able to give constant output of 20mA upto a load of 2 kohms with high output open circuit voltage of 250 volts	
5	Test Frequency	25 KHz as per IEEE	
6	Measurement Range	0.05 ohms to 2 k Ohms	
7	Short Circuit Current	20 mA Automatic	
8	Measurement Accuracy	+/-2 % to 5%	
9	Display	Graphic LCD Display	
10	Power Supply	15V DC adapter with AC 230V Single phase AC, with in-built Rechargeable battery. Battery capacity of 12V,7 Ah, capable of working continuously for min 6 hrs	
11	Repeatability	The instrument should be proven for repeatability of reading in charged upto 765kV AC and 800Kv DC lines	
12	Memory	Instrument should have internal memory storage up to 2000 results	
13	GPS Location	Should locate Lat-Long of a tower without using Tele communication sim card. Should be supplied along with Laptop / tab.	

14	Mobile Software	Instrument should be supplied with advanced Android application to store the data and GPS integration. Software should have facility to enter tower number & store the data, Latitude & longitude locations automatically in real time.	
15	Calibrator	Kit should be supplied along with standard calibrator to verify the readings of Impedance, Resistance & Inductance. Calibrator should be certified by NABL Labs.	
16	Interface	RS 232/Bluetooth	
17	Peg Check Indicator	Should be provided indication/alarm for error free operation	
18	Accessories	a. Galvanized spikes – 3 no's, b. 5 m,25m,50m test leads- 1 set c. 2 m,9m,15m test leads- 1 set d. AC adapter, Hammer and soft carrying case, manual which are required for testing.	
19	Environment	Temp- -5 d.c to 50 d.c. Storage Temp: -20 d.c to 50 d.c Humidity – 95%RH non Condensing	
20	Calibration certificate	Calibration certificate to be provided from any NABL accredited laboratory	
21	Warranty	The warranty period shall be 12 months for any manufacturing defects.	

Technical Specification of Item No. 1(5)

Optical Time Domain Reflectometer (Brand restricted: EXFO)	
Parameters	**Value**
Wavelengths (nm)	1310 ± 20/1550 ± 20/1625 ± 10/1650 ± 5
SM live port built-in filter	1625 nm: highpass >1595nm Isolation > 50 dB from 1270 nm to 1585nm 1650nm:bandpass 1650nm ± 7nm Isolation > 50dB out of 1650 nm ± 10nm
Dynamic range at 20µs (dB)	39/38/39/39
Event dead zone (m)	0.5
Attenuation dead zone (m)	2.5
Distance range (km)	0.1 to 400
Pulse width (ns)	3 to 20000
Linearity width (ns)	± 0.03
PON dead zone (m)	30
Loss threshold (dB)	0.01
Loss resolution (m)	0.001
Sampling resolution (m)	0.04 to 10
Sampling points	Upto 256000
Distance uncertainty (m)	±(0.75 + 0.0025 % x distance + sampling resolution)
Typical real-time refresh (Hz)	4
Stable source output power(dBm)	-2.5
Reflectance (dB)	±2
In-line power meter	
Input power range (dBm)	1490 nm: - 65 to 18 1550 or 1577 nm : -50 to 28
PON power meter (nm)	Two channels : 1490/1550
Broadband power meter (nm)	One channel: 1270 to 1625
Power uncertainty (dB)	±0.2
Calibrated wavelengths(nm)	1310, 1490, 1550 and 1625
PON power meter spectral band(nm)	1450 to 1530
Broadband power meter spectral band (nm)	1270 to 1625
PON power meter selectable wavelengths (nm)	1490, 1550, 1490/1550
Broadband power meter selectable wavelengths (nm)	1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610, 1625
Display resolution (dB)	0.1
PON power meter ORL (dB)	-55
Broadband power meter ORL (dB)	-50

Technical Specification of Item No. 1(6)

Live fiber Detector (Brand restricted: EXFO)	
Parameters	**Value**
Key features	• Induces minimal loss: ≤1 dB • Detects if a fiber is active or not prior to maintenance • Locates a particular dark fiber using tone recognition (270 Hz, 1 kHz, 2 kHz) • Identifies traffic direction on a live fiber • Displays the power transmitted through the fiber • Non-intrusive fiber identification and power measurement • Traffic direction verification
Fiber type	3 mm, 1.6 mm, 900 µm
Insertion loss (dB)	
Maximum guaranteed	1
1550 nm	0.5
1310 nm	0.3
Power range (dBm)	25 to -35
Power measurement repeatability (dB)	±1
Test time (s)	<6
Size (H x W x D)	245 mm x 45 mm x 55 mm
	AA (1.5V) x 2