

13. TECHNICAL SPECIFICATIONS FOR EARTH TESTER

- 1) The Digital Earth Tester is required for the measurement Resistance of Earth in difficult situations, where noise is present in the earth, Measurement of Earth Resistance for large complex earthing systems, Accurate measurement of Earth Resistance in sub-station site where variation of soil resistivity values will be large.
- 2) The instrument should provide all the functions required for ground system testing: variable frequency, 2 pole, 3 pole, 4 pole, leakage current and ground noise voltage measurement.
- 3) The instrument should be micro processor controlled, flexible and user friendly with rechargeable battery operation with built in voltmeter to measure the ground voltage.
- 4) The instrument should be capable of rejecting noise voltage of 40 V peak to peak and the user can select different test frequencies to minimise the effect of interference and accurate testing in noisy environments.
- 5) Mounted in a robust case and provided with hammer & 4 GI spikes and 50M long cable on a cable winder. Having following features:
 - a. Earth resistance : 0.01 ohm-~~20~~10K Ohms (Auto ranging) with ~~±~~ 10m ohm resolution. (as given is specific to vendor)
 - b. Accuracy : \pm ~~0.5%~~ 3 of reading \pm 2 digits.
 - c. Test frequency : ~~105-160~~ 125Hz in 0.5 Hz steps (as given is specific to vendor and 125hz is more than sufficient)
 - d. Test current : ~~50~~ 20mA (as given is specific to vendor and 20mA is more than sufficient)
 - e. Max output voltage: ~~<50~~ 40V (RMS) (as given is specific to vendor and 40V is more than sufficient)
 - f. Max. Interference : 40V peak to peak (50 Hz)
 - g. Display : 3½ digit Alpha numeric LCD with backlit.
 - h. Operation : Rechargeable LR6 NiMh battery
 - i. Standard : Should comply with KEMA K85B EN61557, VDE 0413 part 7.
 - j. Safety standard : IEC 1010-1 100V CAT-IV & EMC in accordance with IEC61326
 - k. Environmental Protection : IP54
 - l. Operating Temp : 10-55degC, 0-90%RH non condensing.
- 6) Instrument should automatically check and indicate the status on the display (backlit):
 - a. The noise interference in the soil passing the test current is excessive.
 - b. The current spike resistance is too high
 - c. The potential spike resistance is too high.
 - d. The battery status Indication
- 7) Should be supplied complete with leads (50 meters), spikes, hammer.

Bidder should give specification wise compliance statement in their bid

14. **Technical Specification For Off-Line Over Head Transmission Line Fault Locator And Line Signature Analyzer**

1) **SCOPE:** This specification covers design, manufacture, assembly, testing at site, manufacturer's works, packing for transport, delivery F.O.R destination. Installation, demonstration and training at site of microprocessor based Off-line Overhead Transmission line fault locator and line signature Analyser system at FADS anywhere in Telangana. The microprocessor based off-line overhead transmission line fault locator system should be capable of locating and detecting accurately the faults on overhead EHT Transmission lines such as (a) Open Circuit (b) Phase to Earth (c) Phase to Phase (d) Three Phase to Earth faults (e) faults like decapping of insulators, snapping of conductor, flash over of discs, falling of tree branches on the lines, high resistance faults etc.,

The line Signature Analyser system should be capable of identifying in homogeneities present on EHT lines up to 800 kV single, double and multi circuit lines in 100 meters steps and also grade the in homogeneities present in the line based on the severity level of the in homogeneity.

2) **CONSTRUCTION:** The equipment should be robust in construction, facilitate easy operation and should withstand the tropical humid climate and severe seasonal variations. The construction should be suitable for use of indoors as well as outdoors.

3) **GENERAL:** The construction and manufacture of equipment should be mechanically sound and suitable for their grade and purpose. Robustness of construction and performance are the primary consideration and the instruments must be suitable for rough handling during transport to various substation sites by lorry or pick-up van.

4) **DESIGN FEATURES:** The equipment shall be microprocessor based and operate by sending a pulse of high voltage, frequency and duration on the overhead power transmission line to be tested so as to overcome all extraneous noise present on the line and detects the reflected pulse from a discontinuity or change of impedance in the line and the result of detection shall be indicated automatically in kilometers on digital display with a resolution of +/- 100 meters precisely indicating the type of fault. The equipment should be suitable for use on dead HT/EHT lines up to 800 kV single, double or multi- circuit lines. The equipment should also have facility for locating faults on spur lines.

5) **ACCURACY:** The equipment shall be accurate to +/- 100 meters over the entire range of operation and also to overcome, the impact of the following factors on the final result:

- i. Long/Short line.
- ii. Parallel lines (mutual coupling)
- iii. Environmental disturbances

6) **RANGE OF OPERATION:** The equipment should have a minimum range of 1000 km and any fault (open circuit and short circuit) within the range must be displayed.

7) **CALIBRATION:** The calibration of instrument shall be stable over long periods of time without requiring calibration checks and adjustments. The tender should also include a line simulator, electrically equivalent to a suitable length of overhead transmission line, to simulate the indications obtained upon an actual overhead line, both for open and short circuit faults for testing purposes.

8) **LITERATURE:** The tender should be accompanied by full descriptive literature and photographs of the equipment offered, indicating the general layout and circuitry. Any offer not accompanied by the detailed literature will be rejected. In case an order is placed, each equipment should be accompanied with at least 6 manuals showing the drawings and other literature relating to O&M of the equipment.

Any other information & latest features incorporated that is useful for proper functioning of the equipment, which are not specified herein, may be indicated in the offer.

9) **SAMPLES:** If considered necessary, the tenderer should be willing to offer a sample for testing.

10) **FIELD DEMONSTRATION:** If necessary, field demonstration of the off-line overhead transmission line fault locator and line Signature Analyser system may have to be arranged before finalization of tenders.

11) **GUARANTEED TECHNICAL PARTICULARS:** The guaranteed technical particulars in respect of the equipment offered, should be furnished with the tender in a typical form as per schedule-A, in addition to any other technical information which the tenderer intends to furnish and which highlights the performance of the equipment offered. The tenderer should also furnish para-wise comments against each para of the general conditions of the technical specification. The tenderer is free to evolve his own design of the equipment. However, the final choice of accepting any deviations from the above specifications rests with TSTRANSCO.

12) **TRAINING:** The equipment shall be demonstrated for all the specifications at the user site after delivery and the user personnel should be trained for use of the equipment at site on intimation by the field officers after its drawal from the stores and transport to the site.

13) **SERVICE GUARANTEE PERIOD:** The equipment should be designed with the latest state of art technique and shall be serviceable for a minimum period of 5 years and the manufacturer shall be give guarantee of maintenance for a minimum period of 5 years.

14) **SAFETY OF OPERATING PERSONNEL:** The equipment should be safe for operation as it is to be connected on highly induced power lines.

15) **DRAWINGS:** Drawings along with any other literature should be sent with the tender indicating the general layout and circuitry. In case an order is placed, each fault locator should be accompanied with at least six manuals showing the drawings and other literature particulars relating to operation and maintenance.

16) **TESTING, INSPECTION & INSTALLATION:** The supplier should submit factory test results with the equipment. TSTRANSCO reserves its right to carryout any test or inspection, if so warranted in overall interest of TSTRANSCO. The relevant test certificates in respect of satisfactory performance of various components shall be furnished with the tender.

17) Technical features should be as follows:

Sl.No.	Description	Particulars
1.	Range Of Operation (In Kilometers)	1000 kM
2.	Accuracy and resolution	±100 meters & resolution of 100 meters
3.	Voltage range of eht lines	66kV to 800 kV AC Transmission lines including spur lines.
4.	Types of faults/inhomogeneities detected	a. All types of open circuit faults. b. All types of phase to phase faults. c. All types of phase to earth faults. d. Three phase to earth faults. e. Faults like decapping of insulators, snapping of conductor, flash over of discs, falling of tree branches on the lines, high resistance faults etc., f. Signature Analyser: It Should provide the information about in homogeneities present on the entire EHT line in steps of 100 meters and grading of in homogeneities based on these verity level.
5.	suppression of induced voltages	In-built mechanism suitable for operation under heavy induction from adjacent live lines
6.	temperature range of operation	-10 to 70 degrees
7.	provision for testing /calibration of equipment	Testing mechanism should be built-in and/or suitable simulator should be provided.
8.	power supply	230 V, 50 Hz AC mains or in built rechargeable batteries.
9.	type of material used for casing	MS
10.	display	Direct digital reading in kilometers
11	TECHNICAL PARTICULARS OF FAULT LOCATOR	
A	ELECTRICAL	
a	Range of detection of fault	1000kms
b	Resolution	100mts
c	Display of Indication	1”4 digit led display
d	Type of Fault Detection	(a) Short fault (b) Open circuit
e	Type of Transmission	Pulse
f	Detection and Ranging	Transmission pulse return echo. Twelve pulse to pulse correlation and detection.
g	Processing Frequency	>1.5 mHz
h	Power Output	>50kw
i	Temperature Range	-10 to 70 degrees
j	Operation	Power supply from battery power pack
12	TECHNICAL PARTICULARS OF ADAPTER UNIT	
a	Range of Operation	66kV to 800kV, auto matching to any of the lines in the aforesaid ratings
13	TECHNICAL PARTICULARS OF SIGNATURE ANALYZER UNIT	
a	ELECTRICAL	
b	Range	1000 kms
c	Types of lines	overhead eht 66kv to 800kv

Sl.No.	Description	Particulars
d	Resolution	50mts
e	Outputs	4 format printouts
f	Display type	static dynamic
g	Control	automatic mode manual mode
h	Display	backlit lcd 240x128 dots
i	Sensitivity	min. 40 db below short or open circuit reflections
j	Dynamic range of display	auto range 24 db manual range: adjustable to 60 db or better with top clipping
k	Display format	individual R,Y,B phase display and also ryb together all individual phase display could be moved towards left in 5km steps & could be stopped in any position.
l	Printer	external 80 col. 9 pin dot matrix

18) Each Over head Transmission Line Fault Analyser system for 66KV to 800KV EHT line comprising of :

A(i). Fault Locator unit: -- 1No.

- With direct reading of LCD digital display, rugged & portable.
- Maximum range : 1000Kms
- Resolution:100Mts
- Capable of locating various types of short circuit & open circuit faults.
- High resolution zoom blanking capability to locate high resistance category faults & faults on Spur lines from the base location itself.
- Heavy Duty twist lock splash proof output connectors.
- Extremely simple operation. Does not require any line parameter input or pre-calibration.

A(ii) 3 Phase Heavy Duty Adapter unit: -- 1No.

- Complete suppression of all induced voltages from adjacent charged lines including double circuit/multi circuit lines.
- Automatic impedance matching for all lines from 132KV to 800KV.
- In built filter module to eliminate HVDC switching noise as well as other RF noise.
- In built transmitter module housing sophisticated oscillator crystals
- Scale indicator reflecting the dynamic state of the transmitter.
- Heavy duty twist lock splash proof connectors for
 - Power supply input
 - Connection to fault locator/Analyser unit
 - Connection to the 3 phases
- This unit to be connected to the isolated & de-energized line after connecting ground to power line ground.

A(iii). Signature Analyser Unit: --1 No.

- Line Vision cum Auto Analyzer unit.
- Auto Mode: Automatic gain selection and Scan.
- Multi sequence auto run-9 self driven independent data acquisition of the 3 phases.
- Automatically noise eliminated & correlated processed data.

- e) Detailed analysis & hard copy documentation of the entire length of the line.
- f) Analysis of every 100 meter of the line with indication of all in homogeneities present and the degree to which they have developed and their corresponding distances.
- g) Multi formats of printout.
- h) Line Vision Mode: Real time graphic image capture of all the three phases of the line condition providing you clear information of the in homogeneities prevalent.
- i) Manual gain setting is provided for visual & detailed observation of all the three phase simultaneously or individually.
- j) Vision Mode operation for detailed line study; Image Freeze, Image Zoom and Display Scroll- desired areas of the line can be brought into close scrutiny up to a range of 400Km. Increased range print out is optional.
- k) Various formats of printout.
- l) Integrated with T-DAM module.
- m) Direct data transfer to Pentium laptop.

B) Line Simulator Unit & Power pack --1No.

- a) Digital Microprocessor controller heavy duty power supply with 12VAAA dry batteries.
- b) Sustained DC power supply for long period.
- c) Both DC & AC mode choice.
- d) Digital Simulator Facility.
- e) Ideal functional check.
- f) Splash proof twist locking connectors.

C) Data management software incorporated & integrated with specially configured Laptop(HP/Compaq/Lenova/Dell/Fujitsu/Toshiba/BenqQ).

- a) Data management software
- b) Color coded display in multiple formats.
- c) Auto intensity level tabulation.
- d) Processed data output.
- e) Raw data output & storage.
- f) Interpretation into 'open' & 'short' categories for the various inhomogeneous points on the line.
- g) Graphically reconstructed color coded format of EHT lines.
- h) Manual review & scroll of line vision.
- i) Edited & noise erased LSA computation.

D) Accessories for each Units:

- a) Laptop(HP/Compaq/Lenova/Dell/Fujitsu/Toshiba/BenqQ) --1No
- b) Latest printer suitable for printing legible & clear
Print outs of line signatures -- 1No.
- c) Five core cable with connecting terminals. -- 2Nos
- d) Flexible cable with crocodile clip. -- 1No.
- e) Instructions manual. -- 1No.
- f) Log book for test data entry. -- 1No.
- g) Printing papers -- (500 sheets)

Bidder should give the compliance statement against above specifications in offer.

15. Technical Specification : Tower Foot Earth Resistance Meter

1	Functional Requirements	<ul style="list-style-type: none"> a. The instrument should be suitable for measuring earth impedance of tower, without isolating earth wire. b. The test results should be consistence repeatable and immune to electromagnetic interface in live transmission line and substation up to 400kV. c. The instrument should be suitable for 3 and 4 terminal measurement.
2	Operating Frequency	Between 20-40KHz
3	Measurement Range	0.1 to 200Ω, auto ranging type, digital LCD display.
4	Accuracy	±2% of reading
5	Test leads and Accessories	<ul style="list-style-type: none"> a. One complete set of cables with suitable clamps and connectors as required for earth resistance measurement in transmission lines. b. Earth spikes and hammer to drive spikes. c. Test leads should be wound on durable plastic reel. d. Hard carry case for instrument and accessories. e. Operation manual
6	Power Supply	Rechargeable battery. Charger shall be provided.
7	Operating conditions	Temp : 10-50 deg.C, Humidity : up to 90% non condensing.
8	Protection	Should have protection against short circuit and over voltage
9	Testing Methods	High Frequency and Flexible clamp method
10	Display	Color LCD with Touch screen
11	Internal Memory	More than 500MB to store results for reporting purpose

Justification: Point no. 9,10, 11 are important and basic features of any instrument like methodology to be used , display and internal memory to record, also used in major Transco tender specifications

Bidder should give the compliance statement against above specifications in offer.

ABSTRACT OF TOWERS (Tentative)										
Erection of 400 KV QMDC line from 400 KV Kachapur Switching Station to 400/11KV LIS Namapur Substation (19.3 Km) for Additional 1 TMC of water under Kaleshwaram Lift Irrigation Scheme(Link -II) in Karimnagar (old) District										
Wind Zone-3										
Sl. No.	TYPE OF TOWERS	+0 NT	+3 BE	+6 BE	+9 BE	+12 BE	+18 BE	+25 BE	+30 BE	TOTAL
PROPOSED 400KV D/C & MC TOWERS										
1	'DA'	21	0	7	0	0	0	0	0	28
2	'DB'	2	0	2	1	0	0	0	0	5
3	'DC'	4	0	3	0	0	0	0	0	7
4	'DD'	5	0	3	3	0	0	0	8	19
Total =										59
CONTINGENCY QUANTITIES IN VIEW OF ANTICIPATED ROW PROBLEMS										
1	'DA'	2	0	1	0	0	0	0	0	3
2	'DB'	0	0	1	0	0	0	0	0	1
3	'DC'	0	0	1	0	0	0	0	0	1
4	'DD'	0	0	2	0	0	0	0	0	2
Total =										7
Total=										66
TOTAL TOWERS INCL. CONTINGENCIES										
1	Tangent Towers incl. contingencies							31	No.s	
2	Small Angle Towers incl. contingencies							6	No.s	
3	Medium Angle Towers incl. contingencies							8	No.s	
4	Large Angle and Dead End Towers incl. contingencies							21	No.s	

ABSTRACT OF TOWERS (Tentative)										
Erection of 400 KV QMDC line from 400//11KV LIS Velgatoor Substation to 400/11 kV Namapur Substation of line length 22.5 Km for additional 1 TMC works under Kaleshwaram Lift Irrigation Scheme(Link -II)										
Wind Zone-3										
Sl. No.	TYPE OF TOWERS	+0 NT	+3 BE	+6 BE	+9 BE	+12 BE	+18 BE	+25 BE	+30 BE	TOTAL
PROPOSED 400KV D/C & MC TOWERS										
1	'DA'	20	0	10	0	0	0	0	0	30
2	'DB'	0	0	5	2	0	0	0	0	7
3	'DC'	4	0	2	0	0	0	0	0	6
4	'DD'	5	0	3	6	0	4	2	2	22
Total =										65
CONTINGENCY QUANTITIES IN VIEW OF ANTICIPATED ROW PROBLEMS										
1	'DA'	2	0	2	0	0	0	0	0	4
2	'DB'	0	0	1	0	0	0	0	0	1
3	'DC'	0	0	1	0	0	0	0	0	1
4	'DD'	0	0	2	0	0	0	0	0	2
Total =										8
Total=										73

TOTAL TOWERS INCL. CONTINGENCIES

1	Tangent Towers incl. contingencies	34	No.s
2	Small Angle Towers incl. contingencies	8	No.s
3	Medium Angle Towers incl. contingencies	7	No.s
4	Large Angle and Dead End Towers incl. contingencies	24	No.s