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MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION FOR

Van mounted modular fault location systems for low and medium voltage cables.

INDEX

1.0 Scope :

This specification covers Van mounted modular fault location system for low and medium voltage underground cables in MSEDCL distribution network.

1.1. It is not the intent to specify, completely here in all the details of design and construction of the modular fault location system shall conform, in all respects to high standards of engineering, design and workmanship with recent editions. It shall be capable of performing in continuous & trouble free operation up to the supplier's guaranteed life of equipment in a manner acceptable to the purchaser who will interpret the meanings of drawings and specifications and shall have power to reject any work or material which, in his judgment, is not in accordance therewith. The modular fault location system offered shall be complete with all components necessary for its effective and trouble free operations. Such components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in this specification and/or in the commercial order or not.

1.3 The Tenderer/supplier shall bind himself to abide by these considerations to the entire satisfaction of the purchaser and will be required to adjust such details at no extra cost to the purchaser over and above the tendered rates and prices.

1.4 The system should be compact multifunctional cable fault locator which shall be used for Cable Testing, Fault Pre-Location, Pin-pointing and Fault Conditioning etc. Test system should be versatile to test HT & LT cables of different types, sizes and various voltage levels like 33KV, 22 KV, 11KV, 6.6KV and 415V. The kit shall be used for cable types namely XLPE, PVC, PILC with Al / Cu conductor. Unit should be portable and all the features explained below should be inbuilt into one unit except the pre-locator and pinpointing set. There several runs of cables of different voltage levels are laid on common racks / underground trench and during the cable fault identification process, nearby cables shall be in charged condition; hence the accuracy of the set being offered shall not suffer due to the above. The set shall be capable to identify and locate faults for all types of cable faults including high resistance, low resistance or intermittent / flashing faults using a microcontroller based with latest software single menu driven (Through single knob) operation.

1.5 The Technical specification required for comprehensive multifunctional Cable Fault Locator is given below. Point-wise conformity to the specifications shall be submitted along with the offer without which the offer shall be liable for rejection.

2.0 Auxiliary Power Supply:

230Volt. 50Hz (Single phase 32Amp connection) Separation transformer 2 kVA (To normalize the fluctuation of Supply) CEE-plug for extended requirements as Burning, Air Condition etc. The system shall monitor input voltage and current during operation and if voltage is exceeding the limits then shall trip and give error message.

3.0 SERVICE CONDITIONS:

The Equipment supplied against the specification shall be suitable for satisfactory

Operation under the following tropical conditions:-

3.1	Max. ambiant température	: 45 Deg. C
3.2	Min ambiant température	: -5 °C
3.3	Max daily average ambiant température	: 40°C
3.4	Min yearly average ambient temperature	: 30°C
3.5	Max. relative humidity	: 100 %
3.6	Max. annual rainfall	: 1450 mm
3.7	Max. wind pressure	: 150 kg/sq.m.
3.8	Max. altitude above mean sea level	: 1000 mtrs.
3.9	Isoceraunic level	: 50
3.10	Seismic level (Horizontal acceleration)	: 0.3 g.
3.11	Climatic Condition:	Moderately hot (exposed to sun) and Humid tropical climate fungus growth The climatic conditions are prone to wide variations in ambient conditions and hence equipment shall be of suitable design to work satisfactorily under these conditions.

4.00 REFERENCE STANDARDS:

4.1 The modular fault location system for low and medium voltage underground cables including the operating devices, accessories and auxiliary equipment forming integral part thereof, shall be designed, manufactured, assembled and tested in accordance with the relevant standards, specification and codes of practices, referred to herein and shall be the latest editions including all applicable official amendments and revisions. The design, manufacture and performance of the equipment shall comply with all currently applicable statutes, regulations and safety codes.

Unless otherwise specified, the equipment offered shall confirm to the latest applicable Indian, IEC, British or U.S.A Standards and in particular, to the following:-

IEC 60068	Insulation coordination
IEC 61010	Standard for safety requirements for electrical equipment for measurement, control, and laboratory use
IEC 61000	Standards for measurement techniques
IS 1248/2003	Indicating instruments.
EN 60-950	Product Safety testing standard for "Information Technology Equipment" (known as ITE)
IEC 60529 / EN 60529	Protection against accidental contact, foreign Objects and water

4.2 The components and devices which are not covered by the above standards shall confirm to and comply with the applicable standards ,rules, codes, and regulations of the internationally recognized standardizing bodies and professional societies as may be approve by the Employer and the manufacturer shall list all such applicable standards, codes etc

4.3 Equipment conforming to any other internationally accepted standards, will also be considered if they ensure performance and constructional features equivalent or superior to the standards listed above. In such case, two copies of such standards in authentic English translation, if the language of the standard is other than English shall be provided. In case of dispute, the stipulations in the English translation, submitted by the manufacturer shall prevail. Further, in the event of conflict between the stipulations of standard adopted by the manufacturer and the corresponding IEC/Indian Standard Specification, the stipulation of Indian Standard Specification shall prevail.

5.00 GENERAL TECHNICAL PARAMETERS:

The equipment shall be capable to test underground power cables of 11KV,22KV,and 33KV and 415 LT cable for fault locating.

The cable fault location system shall comprise of –

(a) HV module for DC testing and surging,
(b) Microprocessor controlled cable fault pre-locator having the following pre-location methods;
    1. Pulse Reflection Method
    2. Arc Reflection Method (ARM) / Secondary impulse method.
    3. Impulse Current Method
    4. DECAY method
    5. Burning Method
(c) Fault pin-pointing set
(d) Cable Locator & Cable Identifier

The Cable fault locating system shall be versatile, capable supportive to locate faults in a wide variety of power distribution cable networks. The unit shall be complete in all respect with all the necessary items, accessories and test technique and shall be ideal to ensure its maximum performance to detect faults or conditions for short, medium or long underground distribution cable networks. The equipment should be Van Mounted solution fixed as per good engineering practices. The Van will be supplied by MSEDCL. The required engineering for mounting cable fault locators & additional accessories shall be in scope of supplier.

The cable fault locating system should have centralised control unit i.e a single unit through which all the devices in a cable fault locator van can be operated on single screen. This system shall ensure safety of the operator as well as nearby people & shall ensure safe operation of system.
Data export software XLS/XLSX for spreads sheet application & .Xml for google map.

SPECIFIC TECHNICAL REQUIREMENTS:

5.1) H.V. Thumper /Surge Generator : -

The Surge Generator should be suitable for pinpoint location of cable faults up to 33kV.

The Details shall be as follows.

Sr. No.	Particulars	Technical Specification
1.	Rated Output	0 to 4-8-16-32 kV continuously variable at each range.
2.	Out Put Capacity	Minimum 1750 Joules at each step for 8/16/32KV and minimum 1200 Joules for 4KV range.
3.	Impulse Sequence	Adjustable 3-10 sec. and single shot.
4.	Input Voltage	Single Phase , 230 V +/-10 % @ 50 Hz.
5.	Metering	For Output Voltage. Current surge energy. The Metering shall be digital & shall display actual surge energy, Voltage & current.
6.	Safety Features	Thermal Trip, Zero Interlocks, Tripping fuses for HV/LV controls, Auto safe discharge of surge capacitor after switch off & in the event of drop in mains voltage. Emergency OFF switch. Main Input circuit breaker (MCB) separate system & protection grounding device.
7.	Indications	HV ON, Auxiliary supply ON
8.	Other Accessories	1.HV cable of 60KV class of insulation and 4 Sq.mm, minimum 50 meters long with suitable connecting clamps. 2.Earthing cables of min.50 meters long with minimum size of 16sq.mm, class 1.1 KV suitable connecting clamps. 3.Mains cables of min. 50 meters long with minimum size of 2.5 sq.mm x 3 C. 4.Auxilary Earthing cable 15 meters long minimum size of 4 sq.mm All cables shall be supplied on rewind able cable Drums mounted on vehicle.
9.	Size & weight	Weight should not be more than150kg.
10.	Operating Temperature	-10°C to +50°C

5.2 Microprocessors controlled cable fault pre-locator:

The Microprocessors controlled cable fault pre-locator equipment shall be suitable for pre-location of cable faults by following methods-

Modes of operation:

1. **Pulse Reflection Method** - A pulse induced at the starting end of the cable reaches the cable fault with a speed of v/2 and then is reflected back toward the starting end of the cable. The elapsed time multiplied by the diffusion speed v/2 gives the distance to the source of the fault.
2. **Arc Reflection Method** - The arc reflection method of fault pre locating combines the use of a TDR (cable radar) and a surge generator.
3. **Impulse Current Method** - based on impulse current oscillations. When a surge pulse is applied on a faulty core, the breakdown cause high current impulses are generated. They will start oscillating on the cable from fault point to instrument.
4. **Voltage Decay Method** - High dc voltage is applied gradually to the cable under test charging its capacitance until the high resistance fault breaks down.
5. **Burning Method** - Used for high resistance fault upto 20kv ignition Voltage.

Technical details of above system shall be as follows.

Sr. No.	Particulars	Technical specification
i)	Mode of Operation	Pulse Reflection, Arc Reflection Method, Impulse Current Method, Decay Method, Burn mode (32kv, 160 mili Amp)
ii)	Measuring Range	0 to 50Km in suitable steps & HV method with sampling rate up to 400 MHz .
iii)	Resolution	0.1 meters (at V/2 80 m/μsec.)
iv)	Pulse Width	20 ns ....10 μsec
v)	Fault Measuring Accuracy	0.1% of measuring range.
vi)	Velocity propagation	10 – 150 μsec
vii)	Display	Colour 10.4" full LCD/LED display
viii)	Sampling Rate	Upto 400 MHZ on higher side.
ix)	Memory	Shall have capacity to store minimum 50 memories required.
x)	Power Supply	Shall work on single phase 230 V AC,50 Hz, supply as well as on internal Rechargeable Battery 12 V.
xi)	Weight & size	It should be light in weight & compact in Size.
xii)	Interface	USB & Ethernet Port

The Arc reflection filter unit to be used to prelocate the high resistance, intermittent and flashing faults in conjunction with digital fault prelocator HV surge generator in arc reflection method, automatic discharge to be incorporated for discharging the HV leads in case of power breakdown or an interruption.

All necessary units required using the equipment in the above modes such as Arc reflection filter and CT and couplers should be included in the scope of supply.

5.3) D.C. H.V. Tester:

H.V. test instrument for testing of di- electric strength and insulation of the cable and cable installation.

Sr. No.	Particulars	Technical specification
1)	Test Voltage	0-32KV(DC) in suitable steps 4/8/16/32KV
2)	Test range	0-4/0-8/0-16/0-32KV (Selectable)
3)	DC-test (kV) / I max (mA)	0 ... 32 KV / 2 mA
4)	Input Power	230 v, 50 Hz
5)	Display	Digital
6)	Protection	The instrument should be operational through control unit and should have protective PCBs for auto discharge, capacitor discharge, earth monitoring etc.
7)	Features	Unit should have latest communication ports like USB and Ethernet ports.

The surge generator and DC tester shall be integrated as one unit and prelocator with all fault location methods as mentioned above to form a complete cable fault locating system and this shall be mounted on a suitable vehicle. In Arc reflection mode, unit should capture multiple fault traces minimum 14 on one single surge pulse. User should be able to select the best out of all the traces using the control Knob. The test report of same feature shall be submitted for verification.

5.4) Cable Fault pinpointing set :

The bidder shall supply a portable, battery operated instrument consisting of a receiver and combined sensor. Which will measure electromagnetic and acoustic signals. The instrument shall pin point the location of faults when used with the surge generator. The strength of the magnetic field provided by the generator shall be indicated on a clear digital display. The measurement of acoustic noise shall be optimized through a switch-able filter which has a bandwidth designed to minimize ambient noise i.e. Vehicles, wind, etc. The pin-point equipment should work in TAR road, Cement concrete roads, and the ground microphone supplied should be wind protected. Coincidence measurement shall be possible by receiving and displaying both sensors simultaneously. The instrument shall also indicate the distance between the sensor and fault based on the time taken by the travelling signals.

Technical specification for pinpointing set:

Sr. No.	Particulars	Technical specification
1)	Display	3 digit 7 segment LCD Display with backlight-separate channel for Acoustic & Magnetic, overflow display for distance value >100 msec.
2)	Broad band frequency range	Magnetic/ Acoustic –100Hz to 1.5KHz (with filter)
3)	Amplification Gain	Acoustic - > 110 dB Magnetic - > 110 dB
4)	Back Ground noise Reduction	Inclusive
5)	Impedance for ground microphone & Headphone	500 Ohm
6)	Weight & size	It should be light in weight & of small size so that the operator can walk easily & concentrate on the fault easily.(not more than 3.5kg)
7)	Power supply	As per requirement
8)	Accessories	1) Ground Microphone suitable for pinpointing & sensing the acoustic as well as magnetic signals in concrete road, tar road, rocky & sandy soil. It Should be wind protected 2) Special Head Phone suitable for hearing & listening the lowest possible acoustic signal.
9)	Ingress Protection Class	Shall be minimum IP – 54 (For receiver) Shall be minimum IP – 65 (For sensor)

1) It should have an auto ranging facility with a digital readout of relative distance to the fault

2) It should have Bar graph-indication of the magnetic field strength for locating the cable path.
3) It should have Indication of battery condition.

5.5) Cable Locater and Identifier:

The Portable Cable Locator and Identifier should precisely locate and trace underground power cables, should comprise of the following major components -

a) Receiver:

1. Receiver should contain LCD display.It should be light weight up to 2Kg
2. Internal alkaline battery holder and Rechargeable Battery Pack having battery back-up of continuous 20 hrs. (Min.) and intermittent 70 hrs. (Min)
3. Receiver should have Transmitter mode, Power Mode, RF mode.
4. Receiver should contain facility to apply minimum 36 active frequencies in the frequency range 512Hz to 200kHz. Frequencies should be user configurable.
5. Guidance : instrument should have :
   - left right arrow function
   - compass for providing orientation /line direction
   - Current signal strength should be visible on receiver display.
6. Receiver should also have current measurement function. There should be option to view the current measurement, live / in real time (when used in transmitter mode) during route tracing process.
7. Depth range measurement capability in transmitter mode: Upto 8m or higher. There should be option to view the depth measurement, live / in real time (when used in transmitter mode) during route tracing process.
8. Depth range in Power / RF mode : Minimum 2m.
9. Temperature Range: Operating -10 to +50 Deg. C .
10. Weatherproof and complying to : IP65
11. Inbuilt GPS & Bluetooth facility.

b) Transmitter : (Output: High power transmitter with Lithium ion Rechargeable Battery)

1. Wattage : > 10 Watts/85V/400mA or higher.
2. Frequencies available: frequencies in transmitter should be available upto 200kHz and user configurable including 117.850 kHz, 82.315 kHz, 65.536 kHz, 32.768 kHz, 8.192 kHz, 1.0 kHz, 877 Hz, 815Hz, 640 Hz & 512 Hz;
3. Display type: LCD
4. Internal Battery: Lithium ion rechargeable Battery pack of capacit 10AH.
5. Accessories: Direct Connection Lead and ground rod, signal clamp 4''
6. It should be light weight up to 3Kg.
7. Receiver along with transmitter should work as cable identifier when cable identifier clamp is attached to the receiver.

5.6 Cable Drums:-

The unit shall be supplied with 50 meters cable each required for –

1. H.T. Cable
2. Grounding Cable.
3. Power Supply Cable.

6.00 Vehicle

Equipment shall be compact in size and shall be mounted on any compact vehicle like Mahindra Bolero/Maruti EECO or any vehicle with a suitable payload.

7.00 Safety Features

- Automatic Discharge and earthing switch.
- Protective Earthing cable min. 16 mm² for equity in potential between cable test van and station ground.
- Safety switching device with warning lights and an external Emergency-Off switch.
- Door Interlock- system will not operate if vehicle HV area Door is open.

8.0 TYPE TEST :

8.1 The tenderer shall furnish detailed type test reports of the Offered instrument for all the test as per Relevant standards. All the above type testes shall be carried out at laboratories which are accredited by the National Accreditation Board for testing and calibration laboratories (NABL) of Government of India/ International accredited laboratories to prove that the instruments offered meet the requirements of specification.

8.2 The Purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost. For this purpose, the tenderer shall quote unit rates for carrying out each type test. However, such unit rates will not be considered for evaluation of the offer. In case the unit fails in type test, the complete supply shall be rejected.

The Successful tenderer shall take approval / waival of type test from Material Specification Cell, Prakashgad, Bandra, Mumbai prior to commencement of supply

In addition to type test reports, the tenderer shall furnish detailed Calibration report of the offered instrument carried out at NABL approved Laborites/ International accredited laboratories on all the equipment of cable fault locating system as per relevant standards to prove that the instrument offered meet the requirements of specification.

The list of type test reports as per applicable standards mentioned in following table shall be submitted with the offer. The offer without type test reports shall not be

considered & offer will be treated as irresponsive. Type testing should be carried out within 5 years from the date of opening of tender.

Type Test Particular	Standard Applicable
EMC Generic Emmision	DIN EN 61000-6-4
EMC immunity for industrial environments	DIN EN 61000-6-2
Environmental testing – Part 2 : Test A :Cold	DIN EN 60068-2-1
Environmental testing – Part 2 : Test B : Dry Heat	DIN EN 60068-2-2
Environmental testing – Part 2 : Test C : Damp heat, steady State	DIN EN 60068-2-66
Environmental testing – Part 2 : Test For : Vibrations	DIN EN 60068-2-6
Safety Requirements for electrical equipment	DIN EN 61010-1
Degrees of Protection provided by enclosures (IP Code)	EN 60 529

9. PRE DESPATCH INSPECTION:

The inspection shall be carried out at all the place of manufacturer unless otherwise. agreed upon by the manufacturer and purchaser at the time of purchases. For imported equipments the supplier/tenderer shall offer the equipment at the authorized service centre /works of the original manufacturer in India or at the supplier's works/Testing centre. The manufacturer shall offer to the inspector representing.

The purchaser all the reasonable facilities, free of charge, for inspection and testing to satisfy him that the material is being supplied in accordance with this specification.

The joint inspection of the equipment will be carried out by inspection wing & the appointed Executive Engineer testing division.

10.00 GUARANTEE :

The instrument shall be guaranteed for the period of five years from the date of commissioning or five and half years from the date of Dispatch whichever is earlier. The Instrument found defective within the above guarantee period shall be replaced / repaired by the supplier free of cost within one month of the receipt of intimation, If the defective instruments are not replaced/repaired within the specified period above, the MSEDCL shall recover an equivalent amount plus 10 % supervision charges from any of the bills of the supplier.

11.0 Packing:

11.1 The instrument shall be suitably packed in order to avoid damage or disturbance during transit or handling. Each instrument may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the cartoon may be suitably sealed. A suitable number of sealed cartons may be packed in a case adequate strength with extra cushioning if considered necessary. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents

11.2 The following information shall be furnished with the consignment :

- Name of consignee
- CE marking
- Details of consignment
- Destination
- Total Weight of consignment
- Sign showing upper / lower side of the crate.
- Sign showing fragility of the material.
- Handling and unpacking instructions
- Materials indicating contents of each package
- Bill material

12.00 DEMOSTRATION OF EQUIPMENTS TRAINING OF ENGINEERS :

The successful supplier contractor shall train Engineers of the Purchaser free of charge on site for familiarization of design, application, operation and maintenance of the instrument at least for one year.

13.00 SCHEDULES :

The tenderer shall fill in the following schedules which are part and parcel of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule A – Guaranteed Technical Parameters
Schedule B - Tenderer's experience.

The tenderer shall submit the list of orders for similar type of equipment, executed or under execution during the last three years, with full details in the schedule of tenderer's experience (Schedule 'B') to enable the purchaser to evaluate the tender

SCHEDULE - B

SCHEDULES OF TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed/under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

Sr. No.	Name of Client and Description of Item	Value of Order	Period of Supply and commissioning	Name and Address to whom reference may be made
1	**2**	**3**	**4**	**5**

NAME OF FIRM_____

NAME & SIGNATURE OE TENDERER_____

DESIGNATION_____

DATE_____

Schedule A

Guaranteed Technical Particulars

Sr.No.	Particulars	BIDDERS OFFER
1.	**Surge Generator (Thumper)**	
2.	Reference Standard - IEC or Equivalent	
3.	Manufacturers Name and Address	
4.	Manufacturers Type	
5.	Manufacturers Authorization	
6.	Voltage Range in KV - in steps i) 0-4 KV ii) 0-8 KV iii) 0-16 KV iv) 0-32 KV	
7.	Discharge Energy in Joules -1750 J (Min.) for each voltage range & 1200 Joules at 4kV	
8.	Voltage – Adjustable	
9.	Display -Analogue	
10.	Cycle time- 3 to 10 seconds and single shot	
11.	Input Voltage - 230 V ± 10% at 50 Hz	
12.	Operating Temperature Range - Upto -10°C To 50°C	
13.	Weight : not more than 150 kg.	
14.	**Microprocessor controlled cable fault pre-locator -**	
15.	Measuring Range - 0 - 50 km.	
16.	Resolution – 0.1Mtr	
17.	Pulse Width - 20 ns ... 10 µs	
18.	Sampling rate – more than 400 MHz (real sampling rate)	
19.	Accuracy- ± 0.1% of range	
20.	Display Colour – 10.4" color LCD/LED	
21.	Modes - Pulse Reflection, Impulse Current Method, Arc Reflection Method, Decay Method, Burn mode	
22.	Memory & Communication port - Min. 50 memories & USB Port with Ethernet port.	
23.	Input Voltage - 230 V ± 10% at 50 Hz	
24.	Operating Temperature Range -Upto -10 °C to 50 °C	
25.	Current coupler/voltage coupler. Tenderer should supply accessories suitable for their prelocator	

Sr.No.	Particulars	BIDDERS OFFER
26	Arc Reflection Filter	
27.	Operating Temperature Range - up to 10 °To 50°C	
28.	Accessories to be supplied - To be supplied with all the necessary and standard accessories with instruction manual.	
29.	**D.C. H.V Tester** -	
30.	Test voltage -0-32KV in suitable steps 4/8/16/32KV	
31.	DC-test (kV) / I max (mA) : 0 ... 32 / 1,8	
32.	I/P Power -230V, ± 10%, 50 Hz	
33.	Metering-Analogue	
34.	Safety features - The instrument should be operational through separate control unit and should have protective PCBs for auto discharge, capacitor discharge, earth monitoring etc	
35.	**Fault pin-pointing set**	
36.	Reference Standard - IEC or Equivalent	
37.	Manufacturers Name and Address	
38.	Manufacturers Type	
39.	Manufacturers Authorization	
40.	Amplification Adjustment range -Acoustic channel > 110 dB Magnetic channel > 110 dB	
41.	Display - LCD 3 digit / 7 segment display	
42.	Frequency range with filter -Generally with in 100 Hz to1.5 kHz for (Acoustic), & 100 Hz to 1,5 kHz with filter. Automatic Mute function for headset	
43.	Power supply – As per requirement	
44.	Weight – (not more than 3.5kg)	
45.	Operating Temperature Range - upto -10 °C To 50°C	
46.	Accessories to be supplied - To be supplied with all the necessary and standard accessories, i.e. receiver, sensor, headphones, batteries carrying pouch along with instruction manual	
47.	**Cable Locator -**	
48.	Reference Standard -IEC or Equivalent	
49.	Manufacturers Name and Address	
50.	Manufacturers Type	
51.	Manufacturers Authorization	

S.N.	Particulars	Bidders Offer
52.	**Audio Frequency generator -**	
53.	Out put Power -0-10 W with suitable selectable steps.	
54.	Output frequency.	
55.	Should consist of background noise reduction feature	
56.	Power supply - 230V,±10%, 50 Hz	
57.	Dimensions & Wt – (not more than 5 kg & portable in	
	size)	
58.	Operating Temperature Range – Upto (-10 °C to 50 °C)	
59.	Accessories to be supplied -To be supplied with all the necessary and standard accessories and instruction Manual	
60.	Indication - Analogue indication.	
61.	**Audio frequency receiver** -	
62.	Reference Standard - IEC or Equivalent	
63.	Receiving frequency - 50 Hz, & output frequency of the Generator	
64.	Gain – Auto & Manual Control.	
65.	Indications- LCD indication of signal & battery check	
66.	power supply : Lithium Ion	
67.	Power output 0-10 watts	
68.	frequency 480Hz,1450Hz & 9820Hz	
69.	Dimension & weight (not more than 3kg & portable in size)	
70.	Operating temp. range - 10^0C to 50^0C	
71.	Accessories to be supplied with all the standard accessories like search coil special type of headphone connecting leads along with instruction manual etc.	
72.	**Cable Identification Instrument**	
73.	**Transmitter**-	
74.	i)Wattage : >=10 Watts	
75.	ii)Frequencies : 200kHz and user configurable including 117.850 kHz, 82.315 kHz, 65.536 kHz, 32.768 kHz, 8.192 kHz, 1.0 kHz, 877 Hz, 815Hz, 640 Hz & 512 Hz	
76.	iii) Power supply - 230V,±10%, 50 Hz & battery (Lithium Ion)	
77.	iv)Accessories: Signal Clamp & carrying case	
78.	**Identification Receiver**	
79.	LCD Display	
80.	Internal Antennas: 2 x Horizontal; and 1 x Null Antenna	

Sr No	Particulars	BIDDERS OFFER
81.	Guidance : Left & Right arrows along ; Compass for providing orientation / Line directions	
82.	Current Measurement Function	
83.	Depth Range : upto 8Mtr. Or higher	
84.	Depth range in Power / RF mode : minimum 2 meter	
85.	GPS : instrument should have built in GPS	
86.	Cable, Cable drums and vehicle and other accessories -	
87.	HV Output cable of insulation 40kv.	
88.	Mains cable 50 Mtr Long.	
89.	Earthing cable 50 Mtr Long	
90.	Cable Discharge Rods	
91.	Cable Drums - Hand operated drum Suitable for Rewinding of HV cable, mains cable& Earthing cable.	
92.	Vehicle - The Surge generator, digital cable fault prelocator, D.C testing set up ,arc reflection filters and cable drum forming a compact portable fault locating System shall be mounted on suitable vehicle with all necessary accessories.	
93.	**Guarantee and training**	
94.	Guarantee - All the supplied equipments accessories shall be guaranteed for 5 years with free replacement in case of any manufacturing defects.	
95.	Training -Successful bidder shall impart theoretical as well as practical training/demonstration to testing engineers and staff at site, at various locations	