RAIL COACH FACTORY, KAPURTHALA		
Specification No.	**Description**	
Mech/M&P/3100/GM/28 Rev.- NIL	Underground Cable Fault Locator	**Covering Page**

Designation	Name	Signature	Date	Level
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Issue/ Rev	Changes	Date

1.0 IMPORTANT INSTRUCTIONS TO TENDERERS FOR FILLING TECHNICAL BID

1.1 Bidders are required to give clause wise comments on the technical specifications, confirming compliance/non-compliance with details of deviations if any along with their effect on the performance. Back references to be avoided, offers are likely to be ignored in case of non-compliance of these instructions for furnishing the information.

1.2 Unless otherwise stated, latest alterations/ revisions of specifications/ standards/ drawings shall be applicable. In respect of safety standards and environmental standards relevant to the machine, the machine manufacturers shall ensure compliance with international (CE/ISO/DIN/JIS)/National standards (IS) (where applicable).

1.3 Tenderers should offer and quote for all the specified concomitant accessories, as these are considered essential for commissioning and utilization of the machine. Even if bidder does not recommend the purchase any of these accessories, the price must be quoted for comparison purposes and their recommendation/suggestion indicated in the offer. Tenderers should also quote for optional accessories, spares and consumable spares as asked in the specifications.

1.4 In case, any item is required in sets, please specify nos./pieces per set. This is essential for proper technical evaluation of the offer. Offers received without this may be considered as incomplete and liable to be rejected.

1.5 The bidder should quote only for the specified make of sub-assemblies and equipment wherever specified. Makes of sub-systems other than the specified ones will normally not be acceptable. In case, some other make is quoted, specific reasons for the same including its features/advantages over specified makes must be brought out in the offer.

1.6 In case there is a contradiction in any information provided (some parametric values given in the specification and those given in the brochure or some other document enclosed by the tenderer), unless specifically mentioned in the deviation cum confirmation statement the values as given in the specification shall be taken as confirmed by the tenderer and offer evaluated accordingly.

1.7 The Purchaser may accept internationally accepted alternative specifications which ensure equal or higher quality than the specifications mentioned in the Technical Specification. However, the decision of the Purchaser in this regard shall be final.

1.8 Purchaser reserves the right to verify the details submitted by the bidder by actual site visits.

1.9 Other terms & condition of the contract will be as per Indian Railway Standard conditions of contract.

2.0 DESCRIPTION AND SCOPE OF SUPPLY:

2.1 This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply, delivery, installation & commissioning of Underground Cable Fault Locator Suitable for locating fault on Low /Medium / High Voltage Power Cables up to 11 KV Complete with all materials and accessories for efficient and trouble free operation.

2.2 The scope covers complete design, engineering & supply of the Underground Cable Fault Locator system shall be used for Cable Fault conditioning (burn-down), Pre-Location, Pin-pointing & Testing of HT & LT cables of different types & sizes. The set shall be suitable to carrying out the above-mentioned multifunction on power cables of various voltage levels mainly 11KV & 440V grade. The set shall be used for cable types namely XLPE, PVC, PILC with Al / Cu conductor. The cables are laid underground (under plain earth, trenches, or RCC surface), above ground or partly under & partly above ground.

3.0 PURPOSES AND CAPABILITY:

3.1 The cable fault locator set shall be suitable for fault locating and pinpointing the following types of cable faults viz.

i) High resistance.
ii) Low resistance.
iii) Intermittent type or flashing faults.

3.2 The Underground Cable Fault Locator system shall be used for Cable Fault conditioning (burn-down), Pre-Location, Pin-pointing & Testing of HT & LT cables of different types & sizes may be 3-phase short circuit, ground fault, phase fault and open circuit.

3.3 The cable fault locator set should be suitable to locate cable fault and trace cables in areas with multiple energized / de-energized cables in the same route without affecting the accuracy.

3.4 The Underground Cable Fault Locator shall be capable of working in normal Indian Railways workshop environment with maximum ambient temperature up to 48^{o}C and maximum relative humidity up to 98%.

3.5 The cable fault locating should work on input supply of 220 V ± 10%. 50 Hz single phase supply to safeguard the equipment against the abnormally high / low voltage current, the power supply current with a suitable protection system should be incorporated in power supply system

4.0 CONCOMITANT ACCESSORIES:

The following concomitant accessories should accompany the machine:

4.1 Connection Cables:

i) 25 m High Voltage Cable
ii) 25 m Mains Cable
iii) 25 m Earthing Cable

4.2 Tools:

i) Discharging Rod with lead.
ii) Digital Multimeter Reputed make.
iii) Set of spanners, screw drivers etc.

4.3 The cost of each listed concomitant accessory should be quoted separately. Wherever for any reason the cost of any concomitant accessories is included in the basic price of the machine, it should be specifically mentioned.

4.4 Any other attachment / accessory, which in the opinion of the tenderer shall enhance the capability of the Cable Fault Locator, shall be quoted separately bringing out the advantage thereof.

4.5 List of standard accessories which will be supplied free of cost with Underground Cable Fault Locator should be furnished.

4.6 List of any optional accessories, which may be useful to improve the working /efficiency of Underground Cable Fault Locator duly indicating price of each should be furnished.

5.0 BASIC DESIGN FEATURES:

5.1 The cable fault locating system shall consist of the following:

i) Microprocessor based Transient Recorder/Fault Locator.
ii) D.C Test, Surge and Burn Unit in Surge Generator itself.
iii) A pin – pointing set

5.2 Point-wise conformity to the specifications shall be submitted along with the offer without which the offer shall be liable for rejection.

5.3 The Technical specification required of the various units attached to the multifunctional set for Cable Fault conditioning (burn-down), Pre-Location, Pin-pointing & Testing are given below:

5.4 Cable fault Pre-locator

5.4.1 Pre-location of faults in cables shall be carried out using the principle of TDR Method, Impulse Current Method and Decay Method with the help of microprocessor based Digital Fault Locator.

5.4.2 Pre-locator should be Laptop based with 14-inch screen size. Digital display of distance of the fault in meters shall be on Laptop.

5.4.3 Indigenous Indian developed Software for should be Microsoft Windows Standard Interface. Windows based easy menu driven software.

5.4.4 Testing Methods should be Pulse Echo (PEM), Impulse current (ICM) and Decay voltage method.

5.4.5 The Pre-locator shall be measuring fault up to 50 km (with a minimum range of 50 m) The velocity of propagation of the injected pulse shall be variable from 5 n Sec to 10 µs. Dual cursor measurement technique shall be provided to read the distance to fault.

5.4.6 Measuring Accuracy should be +- 1 %.

5.4.7 Gain selection and enlargement facility should be provided without loss of resolution and accuracy.

5.4.8 Display resolution should be 1024 x 768 pixels.

5.4.9 Storage capacity for at least 1,00,000 graphs and the corresponding data in the internal memory.

5.4.10 Online support should be provided immediately via WhatsApp/Internet/Phone for pre-location in case of requirement of graph analysis.

5.4.11 Bridge Method should be provided for pre-location (Murray Loop). High Voltage Murray Loop is suitable for pre-location of low & high resistance constant leakage fault up to 5 K.V. DC. Murray loop gives reading in percentage (%) of cable length and accuracy up to 1% of fault distance. Murray Loop should be portable & battery operated.

5.4.12 The Pre-locator shall be Mains operated.

5.4.13 The Pre-locator shall have a Sampling rate of 200MHz Minimum.

5.4.14 USB port for printer shall be available in the Pre-locator.

5.4.15 Technical data:

Technical Parameter	Specification
Pre-locator with Time Domain Reflectometer	
Pre-location Method	Pulse Echo Method. Impulse Current Method. Decay Method.
Pulse Width	5 n Sec To 10 µs in Pulse Echo Mode
Testing Range	50 M To 50 K.M
Band Width	200 MHz
Interface	USB
Input Power	220-230/240 VAC, 45Hz up to 60 Hz
Display	Laptop based.
Interface	User Friendly graphical User Interface (GUI) Microsoft Windows Standard Interface.
Memory	More than 100000 graphs.
Storage and Protocol	FLT (Fault File) automatically stores over 1, 00,000 graphs in Month, Date, and Time management basis.
Laptop Configuration	Windows 8 & above, Processor Latest, HDD 500GB, RAM 2GB, Screen size 14 Inch & above
No of phases that can be tested at a time	1
Bridge Method	By using Murray loop

5.5 Surge Generator Unit/ Integrated Fault Conditioning Unit (Burn-Down Set):

5.5.1 The Surge Generator Unit shall be used as thumper for charging of cable under test (i.e. defective cable) till sufficient flashover is achieved at the point of fault.

The set shall be used in conjunction with Surge Receiver Unit for fault pinpointing.

5.5.2 Surge Voltage Range: 0–5 KV, 0–10 KV & 0–20 KV.

5.5.3 DECAY Voltage range should be 0-20 KV.

5.5.4 DC High Voltage Testing range should be 0-5/10/20 KV.

5.5.5 Limited burning current should be up to 200 mA.

5.5.6 Surge Energy: Minimum 1000 Joules on each range.

5.5.7 The set should be provided with standard safety features like 'Zero start voltage interlock', 'High voltage ON lamp', automatic grounding upon shutdown, Auto-OFF in case of power supply break and overload protection etc.

5.5.8 Surge rate: Automatic continuously variable from 5 Sec to 15 Sec min. & Manual Single impulse feature shall also be available.

5.5.9 The unit shall be compatible for use with Pinpointing set.

5.5.10 DC and burning unit should be inbuilt in Surge Unit.

5.5.11 The Specification covers the supply of single – phase cable fault location system suitable 440V to 3.3/6.6 & 11 kV U.G. cables.

5.5.12 The system should be capable of locating all types of permanent and transient faults viz, core-to-core shorts, high impedance faults, sheath fault, core breaks, flashovers etc.

5.5.13 The system shall be capable of locating faults in all types of U.G. power cables with all types of insulation up to rating of 20 kV and below.

5.5.14 The system shall be capable for DC testing of cables, pre-locating cable faults using Impulse Current Mode and Decay Mode. Also the system should have burning facility in Surge Generator itself.

5.5.15 The system shall be capable for pinpointing the fault location using acoustic inductive and time delay methods.

5.5.16 DC Testing facility on all ranges in same instrument with 200mA current on 5 kV range.

5.5.17 DC Testing up to 20 kV.

5.5.18 The system should work on an input supply of 230V +/- 10% 50Hz.

5.5.19 This equipment is intended to change the defective cable core till flashover at point of fault.

5.5.20 Surge Energy: 1000 Joules on 5, 10 and 20 KV Range.

5.5.21 Burning Facility: Burning facility with minimum 200 mA on 5 kV, 80 mA on 10 kV & 35 mA on 20 kV. Discharge capacitance shall be out in burning for smooth burning.

5.5.22 Surge frequency shall be controlled automatically as well as manually.

5.5.23 DC Test facility shall be available in the surge unit itself fault burning facility with 200 mA or more shall also be in Surge Generator itself.

5.5.24 The surge generator Voltage should be available in the above mentioned various ranges and the surge energy should be 1000 Joules minimum of each range.

5.5.25 Automatic discharge shall be provided maximum safety to the equipment and operator.

5.5.26 All equipments should be at least 90% Indigenous Made in India.

5.5.27 Technical data:

Technical Parameter	Specification
Output voltage	0-5, 0-10 & 0-20 KV.
Surging Voltage	0-5, 0-10 & 0-20 KV.
Decay Voltage	0-20 KV.
D.C. Testing	0-5, 0-10 & 0-20 KV.
Fault Burning Current	200 mA: 0-5 KV 80 mA: 0-10 KV 35 mA: 0-20 KV
Output Joules	1000 Joules on each range
Surging Sequence	Manual / Auto (5 to 15 Sec)
Metering	Voltage & Current
Input Supply	220-230/240 VAC, 45Hz up to 60 Hz.

5.6 Pinpointing Unit

5.6.1 Dual-channel digital sound system, magnetic & acoustic for the location of faults in underground power cables. It consists of two units, the acoustic transducer (pickup) and the amplifier with headphones.

5.6.2 It should be able to pinpoint the exact location of the fault.

5.6.3 Pinpointing set should be Extremely sensitive acoustic, magnetic sensor.

5.6.4 Coincidence display range should be 0 to 99 mS.

5.6.5 Proportional signal strength should be displayed on large L.C.D. by bar graph for magnetic & acoustic signal.

5.6.6 Numerical value should be provided in pinpointing set for magnetic and acoustic signal strength.

5.6.7 The battery- operated pin pointing set is intended to be used in conjunction with surge generator for pin pointing of underground cable faults by combination of acoustic and magnetic signal. The set should be portable and battery operated (rechargeable battery) with a LCD display facility to indicate various parameters.

5.6.8 It should have adjustable feature for adjusting the electromagnetic gain & acoustic gain.

5.6.9 The unit shall be provided with acoustic headphone set to receive the acoustic signal for pin pointing the fault point.

5.6.10 Operating time should be 30 Hrs on continuous use.

5.6.11 The detailed specifications are as follows:
The pin pointing set should be light weight (shall be < 2Kgs)

Technical data:

Technical Parameter	Specification
Signal Input	Balanced from acoustic pick up. From coil housed within transducer.
Control	Gain control, Sensitivity Control
Gain	> 65 db Acoustic , > 76db Magnetic
Frequency	270 Hz to 3 KHz Acoustic, 100 Hz to 10 KHz Magnetic
Supply Voltage	12 VDC (1.5X8 Pencil cells)
Operating Time	> 30 Hrs on intermittent use
Display	Large illuminated LCD display LCD for measuring results and status information.
Coincidence display range	0 to 99 mS
Measuring functions	Coincidence Measurement Measurement of the magnetic field strength in digits Measurement of acoustic signal strength in digits.
Weight	Should be light weight (shall be < 2Kgs)

6.0 SPARES:

6.1 The tenderer should furnish details of spares covered under warranty.

6.2 The tenderer should be furnishing the price list of spare parts required for two years normal maintenance of the equipment. Sources of supply of spares used other than that of manufacturer should be furnished by the tenderer.

6.3 List of recommended spares for normal maintenance after expiry of warranty period to till useful life of the equipment.

6.4 List of recommended consumables, oil & lubricant for two years shall be quoted separately.

6.5 Useful life estimated/expected for each equipment and its sub assembly should be indicated by the tenderers

7.0 TECHNICAL LITERAUTE:

7.1 One copy of the printed illustrative catalogue showing features of the machine and its elements must be enclosed with each copy of the bid.

7.2 The successful bidder shall furnish for each component 4 copies of spare parts catalogue giving the part list number of each component with exploded views and assemble drawings, maintenance manual troubleshooting guide.

7.3 The supplier/contractor shall be required to furnish to the purchaser office/consignee, whichever is necessary the following documents along with the consignment.

i) Instruction Book.
ii) Test Certificates.
iii) Guarantee card.

8.0 COMMISSIONING AND PROVING OUT

8.1 The Successful tenderer shall have to commission the machine within 15 days from the date of receipt of machine at RCF,Kapurthala.

8.2 The successful tenderer shall have to prove out the performance of the machine at RCF premises to the entire satisfaction of the consignee.

9.0 ELIGIBILITY CRITERIA

9.1 The tenderer shall be registered on IREPS website (www.ireps.gov.in) to participate in the tendering process.

9.2 The tenderer shall have established quality control system and organization to ensure adequate control at all stages of the manufacturing process.

9.3 The tenderer shall provide a performance statement giving a list of major supplies of same/similar equipments effected in last 5 years to the reputed organizations giving details of the order no. and date and the quantity supplied and whether the supply was made within the delivery schedule. Such period shall be reckoned from the date of opening of tender. Tenderer should also provide the prove out test certificate of his supply/supplies.

Tenderer not submitting the requisite information may note that his offer is liable to be ignored.

10.0 SPECIAL FEATURES

Special features incorporated into the machine, if any shall be indicated separately by the tenderer, clearly indicating the advantage of these features.

11.0 MAKE

11.1 The supplier shall furnish the complete details of Model No. Make & Manufacturer's details/ address, Country and authorization details of Dealership.

11.2 The firm shall provide the calibration certificate of National / International Traceability along with validity of at least two years.

12.0 SERVICING FACILITIES

12.0 The tenderer shall clearly spell out in the offer about the facility available with him or his agent/dealer for providing adequate after sales service in Punjab during warranty period.

12.1 The tenderer shall also indicate the service organization located at various places in India and availability of trained staff, maintenance spares etc.

12.2 The contractor shall give a comprehensive spare part list with OEM details and price for all the sub systems.

12.3 The tenderer/contractor shall provide list of spares, consumables required for maintenance for 5 years after completion of warranty period

12.4 For maintenance during warranty following criteria shall be considered.

a) Service engineer of the supplier shall be available for attending to the system faults during first 07 days after successful commissioning of equipments during 09.00 - 17.00 hrs on all working days including Saturdays.
b) Service engineers shall visit RCF on quarterly basis thereafter till the end of warranty/extended warranty period for Preventive Maintenance at least for one full day at a time.
c) In case of any breakdown affecting the performance of the system completely or partly, firm shall depute its service engineer as soon as and when informed by any suitable means like Fax, SMS or email possible after receiving such call.
d) Breakdown period shall be calculated from 8 hours after it's reporting to the firm upto the time it is attended. If intimation to the firm is delayed from Railway's side, then the breakdown period calculation will start from the time by which it is reported to the firm.

12.5 Total up time of the system should be at least 90%. Up time shall be counted in following manner:-

a) Total breakdown of less than 8 hours shall be ignored for the purpose of this calculation.
b) Penalty may be imposed if the down time is more than 10% without any valid reasons. The levy of token penalty as deemed fit based on the merit of the case may also be consider as per clause 17 (b) of GCC -201.

12.6 Warranty period for part or machine shall be extended after completion of warranty period by the duration under which the part or machine remains under breakdown during warranty.

12.7 Tenderer shall provide list of spares, consumables required for maintenance for 5 years after completion of warranty period as per annexure-A

12.8 Tenderer shall provide expected life for the components of the system and provide the maintenance schedule required for 10years for as per annexure -A

12.9 Tenderer shall provide the service charges /per day/per man for deputing service engineer on the machine on requirement separately for Indian and Foreign engineer.

13.0 DEVIATIONS:

The tenderer should clearly certify that the machine offered fully meets the specification various design features incorporated in the machine to fulfil different technical performance requirements should be fully explained in the offer. However, minor deviations from this specification, which do not affect or in any way interfere with the stipulated performance standards, or would result in improved safety/reliability or would reduce recurring maintenance/operating cost of the machine, can be considered for acceptance.

14.0 SCHEDULE OF ANNUAL MAINTENANCE CONTRACT (AMC) FOR PERIOD OF 5 YEARS AFTER COMPLETION OF WARRANTY PERIOD

14.1 Tenderer shall provide proposal for 5 year Annual Preventive Maintenance schedule to be executed after completion of warranty period in the format as per annexure-B.

14.2 The firm shall maintain the machine in good working condition during the contract period and shall correct the fault or failures, repair or replace the worn or defective parts/equipment during the normal working hours of shop where the equipment has been installed. Unserviceable parts/equipment need to be replaced at no extra cost with brand new parts/equivalent or superior specification.

14.3 The firm shall respond by deputing service personal to oral / telephonic/ or other modes of intimation for repair and maintenance of the said machines within 2 hours.

14.4 The firm shall ensure that the machine is in proper working condition, to the full capacity, after repair and maintenance.

14.5 To have a timely supply of spares during AMC, the contractor shall furnish a total list of spares which should contain list of spares that shall be arranged by the firm, both chargeable, duly mentioning the charge against each item, and spares which shall be non-chargeable, and list of spares to be held by RCF.

14.6 The contractor shall clearly list-out the list of consumables required for day-to-day operation of the machine. It shall be the scope of RCF to arrange the consumables once the completion certificate is issued for the retrofitted machine.

14.7 The tenderer/contractor shall provide suitable standby when repairs exceeds 2 hours. When any equipment is taken for repair to the tenderer/contractor's premises suitable standby equipment should be provided.

14.8 Besides attending the breakdown calls, the firm shall attend to the corrective and preventive maintenance of the machines once in a month.

14.9 The AMC is valid for five years from the date of completion of the warranty period . No freight is admissible.

14.10 During the AMC period, whatever equipment is defective shall be handed over to RCF. During completion of the AMC period the machines should be handed over in full working condition to its full capacity.

14.11 The firm should maintain a register duly indicating the nature of defects and repair attended and got signed by RCF authority. Preventive maintenance schedule should be made. The schedule should be made in such a way that more than one machine should not be attended on the same day. A copy of the schedule should be given to RCF at the beginning of the AMC and the schedule should be strictly followed and on carrying out the preventive maintenance the same should be entered in the register and got signed by RCF authority.

14.12 AMC charges shall be paid quarterly as one quarter of the total AMC charges applicable for that year on submission of bills duly certified by the engineers in charge with regard to the satisfactory execution of AMC during the period for which the bill is claimed. Income tax @ 2% or service tax as applicable at the time of payment shall be deducted at source.

ANNEXURE-A

S.N.	Item	Part No.	Service Life	Price

Annexure –B

S.N.	Year	AMC Charges
1.	IST YEAR	
2.	IIND YEAR	
3.	IIIRD YEAR	
4.	IVTH YEAR	
5.	*VTH YEAR*	

15.0 WARRANTY

The warranty condition of contract will be as per IRS conditions or as quoted by the tenderer whichever is later.

Note : Tenderer to furnish following detail of the Underground Cable Fault Locator offered

S.no.	Technical Parameter	Offered by Tenderer

Prepared by
JE/M&P

Agreed by
Dy.CPE-I