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SPECIFICATION NO. *TI/SPC/PSI/LCMLA/0030 Revision 1*

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

सत्यमेव जयते

TECHNICAL SPECIFICATION FOR LEAKAGE CURRENT MONITOR FOR LIGHTENING ARRESTERS

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ISSUED BY

TRACTION INSTALLATION DIRECTORATE
RESERARCH DESIGNS & STANDARDS ORGANISATION
LUCKNOW – 226 011

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SPECIFICATION FOR: **Leakage Current Monitor for Lightening Arrestors**

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SPECIFICATION FOR LEAKAGE CURRENT MONITOR FOR LIGHTENING ARRESTERS

1. SCOPE

1.1. This specification covers supply, testing and commissioning of Resistive Leakage Current Monitoring Equipment for Metal Oxide Lightening Arrestors for Sectioning and Paralleling post, Sub Sectioning and Paralleling post & traction substations on Indian Railways. Tenderers while quoting shall ensure that they have gone through this document and understood the requirements clearly.

1.2 The equipment should be complete with all accessories considered necessary for its efficient operation & functionality. All such equipment, part and accessories shall be deemed to be within the scope of supply, irrespective of being specifically mentioned or not.

1.3 The equipment should be commissioned by the successful tenderer, and the offer shall include deputing of engineers for adequate training towards handling, operation & testing to the satisfaction of the purchaser at site.

1.4 All the components, sub system and accessories shall unless otherwise specified herein conform to the latest edition of respective Indian/International standards and specifications as mentioned in different clauses.

2.0 Governing specification

2.1 The method of measurement principle should be as per Clause 6.3, method B2 of IEC: 60099-5.

2.2 All the components used in this equipment shall unless/otherwise specified, conform to latest edition of respective Indian Standard specification. Where relevant Indian Standards are not available, relevant International Standards of the country of manufacture should be complied with.

3.0 Service Conditions

3.1 The equipment should be suitable for outdoor use in moist tropical climate and in areas subjected to heavy rainfall, pollution due to industry and marine atmosphere and severe Lightening in India. The maximum ambient temperature may reach 50^0C, with maximum humidity reaching up to 100%. However, for design of the equipment, 50^0C category of temperature may be taken (Reference: Table I of IS: 2834).

i)	Maximum temperature of air in shade	-	55^0 C
ii)	Minimum temperature of air in shade	-	-10^0 C
iii)	Max. temperature attainable by an object exposed to sun	-	75^0 C
iv)	Maximum relative humidity	-	100%

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v)	Annual rainfall ranging from	-	1750 mm to 6250 mm
vi)	Maximum number of thunder storm days per annum.	-	85 days
vii)	Maximum number of dust storm days per annum.	-	35 days
viii)	Number of rainy days per annum	-	120 days
ix)	Basic wind pressure	-	200 kgf/m^2
x)	Altitude above MSL	-	2000 meters.

4.0 CONSTRUCTIONAL FEATURES

4.1 General information

4.1.1 The Resistive Leakage Current Monitoring Equipment should be portable for in-service measurements of the resistive leakage current of gapless type metal oxide surge arresters (MOSA) for checking the conditions of the surge arresters on regular or trend dependent basis. The information about the resistive part of the leakage current should give information about the condition of the metal oxide surge arrester. An increased resistive leakage current indicates a higher risk of breakdown of the MOSA.

4.1.2 The measuring method implemented in the measuring system should be based on the principle called third order harmonic analysis of the leakage current with compensation for harmonics in the system voltage. It should comply with amendment 1 of IEC 60099-5 "Diagnostic indicators of metal oxide surge arresters in service", regarding testing method.

4.1.3 The measurement of leakage current or its components shall be done on MOSA fitted with insulated base from ground and having connection to ground through a single lead.

4.1.4 The equipment should be designed in such a way that consistent results of resistive part of leakage current measurement shall be possible for the Lightening arrestors fitted on high gantries (where placing of Antenna probe near base of LA is not possible) by simply putting the Antenna probe at nearby base of PT.

4.1.5 Analyzer should be online i.e. It should be able to measure and analyze leakage current of Surge arresters in charged outdoor condition without any need for shutdown. In addition to above all accessories including Current Probe, Field probe and connecting leads etc. shall have to be properly screened to nullify the effect of interference in charged switchyard.

4.2 Technical details

4.2.1 The Resistive Leakage Current Monitor Equipment shall consist of following:

i. Current probe: clip-on current transformer for measuring the total leakage current through the MOSA grounding lead. It shall be suitably shielded from EMI effects for

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repeatable results in switchyards having system voltage ranging from 25 kV up to 765kV. Current probe shall be with cables of suitable length and built-in temperature sensor

ii. Field (Antenna) probe: Field (antenna) probe to be positioned near the base of the arrester to pick up the third harmonic capacitive current component due to harmonics in the system voltage. The field probe shall have to be connected to the current probe with a suitable coaxial cable. A Telescope rod of fiber glass for mounting the field probes at the base of the LA shall be part of the probe.

iii. Leakage current measurement, recording & processing unit: The equipment shall be capable of using harmonic analysis of current and with compensation of the field probe signal to determine the resistive component of the leakage current through the MOSA as per IEC 60099-5 B-2 standard.

iv. Latest Notebook Computer [Intel Core i7-820QM, 8 Gb (2 x 4 GB, 1333 MHz) DDR3 SDRAM, HDD 500 GB, Display 15.6" Full HD (1080 P) WLED (1920 x 1080), Internal 8X DVD-RW with dual layer write capability, Video card (ATI mobility Radeon HD 5470-1GB), 9-cell lithium ion primary battery, Bluetooth, wireless, card reader] with required Data management software (windows compatible) latest version and programme to down load data from the instrument and to analyze and administer leakage current data.

v. The Resistive Leakage Current Monitor equipment should also include the following items /accessories:

a. Transport case for housing all the accessories during transportation.
b. Grounding wire for the instrument
c. Data cable for connection of instrument to note book/PC
d. Data management system and software (Latest Windows based)
e. Any other accessory/equipment considered necessary for satisfactory working of equipment.
f. User manuals

4.2.2 By using arrester system data, entering/measuring ambient temperature and operating voltage, the leakage current values should automatically be normalized, so that measurements performed under different ambient conditions and voltage are easily comparable.

5.0 Rating & technical particulars

5.1 The leakage current analyzer should measure and display the following parameters in charged Switchyards conditions from 25 kV up to 765 kV:

- Direct display of Total Leakage current of the L.A.
- Direct display of Resistive Leakage Current of the L.A.

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- Direct display of Resistive Leakage current of the L.A. referenced to 20°C and 70% of rated voltage.

5.2 The equipment shall be of compact design, lightweight, portable and handy to enable easy transportation. The equipment should be housed in a dust and weather proof, sturdy metallic housing adequately shielded from electrostatic influence adhering to Class IP 54. The surfaces of the box shall be painted with anti-corrosive paint. The equipment shall be suitable for measuring and indicating results in the following ranges:

Range of Measured Parameters	▪ Total Leakage Current : 200 µA to 9 mA ▪ Resistive Leakage Current : 1 µA to 9 mA ▪ Field probe current : 20 µA to 0.9 mA
Accuracy of Measured Parameters	▪ Total Leakage Current : ± 1 % of the reading (under controlled conditions) ▪ Resistive Leakage Current : ± 1 % of the reading(under controlled conditions) ▪ Field probe current : ± 1 % of the reading(under controlled conditions)
Resolution of Measured Parameters	▪ Total Leakage Current : 1µA ▪ Resistive Leakage Current : 1µA ▪ Field probe current : 1µA
Temperature measurement	The kit should invariably measure the ambient temperature to compensate the resistive current readings taken at temperature other than 20°C. The temperature measurement through built-in sensor shall have manual over-ride facility to manually feed other temperatures, if necessary: • Ambient temperature range : -40 to +70 °C • Accuracy : ± 2 °C
Power Supply	The equipment should have Mains as well as Battery operation capability with built-in battery charger. ▪ Mains voltage operation: 110 - 230 V AC, 50 Hz. ▪ Battery operation : Internal rechargeable battery (NiMH or Li-ion) Capacity: Approx.8 hours use
Communication port	Suitable communication port for interfacing the equipment with PC/notebook computers for data transfer & configuration purpose.
Operating & storage temperature	-10 to +70°C

5.3 The Software package performing the following functions shall be supplied:

- Preparing measurements by defining each arrester and arrester type with operational parameters/arrester system data.
- Storing and Downloading recorded leakage current data.
- Keeping track of the arrester history by presenting recorded data, e.g. by statistical analysis in tabular and graphical form.
- Evaluating groups of surge arrester, e.g. arresters of the same type of arresters in the same region.

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5.4 The equipment's Database shall perform the following duties:

- To define the name of substation, location and name / number of arrester, arrester type with system data etc.
- The equipment should have built in memory sufficient to store minimum 1000 such ID's of arresters.
- The memory should be backed by Lithium Battery having a life of 10 years so that the stored data is not lost when power is switched off.
- After measurements have been performed, the recorded data shall be stored on the right location in the database and same shall be retrievable.
- Real Time Clock supported by battery backup to ensure date and time stamping of the measurements.

5.5 The equipment should have a built-in calibration signal generator that allows quick and simple verification of the kit calibration before critical measurements.

6.0 TESTS

6.1 The inspection and checking of equipment will be carried out by purchaser's representatives prior to dispatch of equipment. This shall include verification of all the features, bill of material & other accessories of the equipment as per this specification.

6.2 The tenderer shall furnish complete technical details along with the manufacturer's test certificates for the performance claimed.

6.3 Any other functional test on the equipment as per this specification considered necessary to verify its working and performance on site shall also be arranged by the successful tenderer if required by purchaser.

7.0 TECHNICAL DATA AND DRAWINGS.

7.1 The tenderer shall furnish guaranteed performance and other necessary technical parameters for the instrument.

7.2 The tenderer shall furnish their compliance or otherwise against each clause/sub-clause of the technical specification. If the tenderer wishes to deviate from the provision of any of the clause/ sub-clause, he shall furnish the full details with justification for such deviations.

7.3 The tenderer shall also furnish descriptive technical literature, assembly layout drawing, schematic diagram etc. for scrutiny to the purchaser.

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8.0 Training of Indian Railways' Engineers

8.1 The offer shall include organizing training of two engineers free of cost at the traction substation of a railway system. The total duration of training shall be 4 days.

9.0 COMMISSIONING

9.1 The instrument shall be supplied and commissioned by the supplier at the purchaser's premises and the performance shall be demonstrated to prove its working.

10.0 OPERATION AND MAINTENANCE INSTRUCTIONS.

10.1 The supplier shall supply free of cost four sets of instruction manuals for operation and maintenance of the equipment. The manuals shall contain full particulars of various components, fully dimensioned drawings, circuit diagram etc.

11.0 SPARES/SPECIAL TOOLS.

11.1 The Tenderer shall quote separately for the spares recommended for maintenance of equipment for a period of at least five years.

11.2 The tenderer shall also quote for supply of special tools, if any, required for operation and maintenance.

11.3 Spare parts/ special tools, as ordered, shall be delivered along with the supply of the equipment.

12.0 Guarantee/Warranty

12.1 The instrument shall be guaranteed for its trouble free performance for a period of 18 months from the date of commissioning or 24 months from the date of supply whichever period is longer

12.2 The tenderer shall also quote separately for two years servicing/ maintenance of the instrument after the scheduled guarantee period is completed.

12.3 The supplier should have a fully equipped Service center with well qualified Service engineers for providing after sales service in India.

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