

KARNATAKA POWER TRANSMISSION CORPORATION LIMITED

TECHNICAL SPECIFICATIONS for “Supply, Installation, Testing and Commissioning of Online Insulation Monitoring & Fault location system for 110V/220VDC unearthed system in KPTCL”.

1. This specification covers the technical design proposal for 110V/220V DC On-Line Insulation Monitoring & Fault Location System up to feeder level and installation of the same in 110/220 V DC ungrounded electric power supply distribution panels of KPTCL Substations.

2. **APPLICABLE STANDARDS :**

All documents listed below constitute a part of this specification. In the event that certain requirements of specifications, drawings or data listed below conflict with the requirements of specification, the requirements of this specification shall govern.

2.1 IEC-61557-8 : Electrical safety in low voltage distribution system to 1000 V AC and 1500 V DC - Equipment for testing, measuring or monitoring of protective measures- Insulation monitoring devices for IT systems.

2.2 IEC-61557-9 : Electrical safety in low voltage distribution systems up to 1000V AC and 1500 V DC - Equipment for testing, measuring or monitoring of protective measures- Equipment for insulation fault location in IT systems.

3. **SCOPE OF WORK :**

- 3.1 GENERAL FUNCTION AND DESCRIPTION :**

3.1.1 Online insulation monitoring & fault location system is required to monitor insulation values of 220 V DC ungrounded electric power supply & distribution system and on-line identify the load feeder with earth fault, 220VDC is obtained from separate power supply rectifiers with battery floating on the output bus.

3.1.2 220 VDC ungrounded system continues to function in case of single ground fault on one pole. The system shall continue to operate unless a second ground fault occurs on the other pole.

3.1.3 The On-line insulation monitoring & fault location system shall be provided to On-line detect the ground fault up to individual feeder level so that ground fault can be removed and electric power supply system can be kept healthy and information on ground fault is displayed locally and in Control Room.

- 3.2 ENVIRONMENT CONDITIONS :**

3.2.1 Ambient temperature : 50°C

3.2.2 Relative Humidity : Min 50% to Max 95% non-condensing

- 3.3 DESIGN REQUIREMENTS :**

3.3.1 The proposed On-line insulation monitoring & fault location system for 220V DC system shall comprise of On-line Insulation Monitor and a Portable Ground Fault Detector. It shall work on AMP+ (Adaptive Measuring Pulse) Principle.

3.3.2 The proposed system calls for locating the fault point by using On-line insulation monitoring system and Portable Ground Fault Detector. However, this system shall be so compatible that it can be upgraded in a later date as & when required by adding on-line fault location system along with Core Balance Current Transformers (CBCTs) for individual feeders so as to immediately pin point the fault location.

- 3.4 110V/220 V DC ON-LINE INSULATION MONITORING & FAULT LOCATION SYSTEM :**

3.4.1 ONLINE INSULATION MONITORING & FAULT LOCATION SCHEME :

Ungrounded 110V/220V DC main control power supply shall be derived through rectifiers with battery floating on output bus. Electric power supply shall be distributed through main bus. The main bus and feeder shall be housed in power supply distribution panels. Each Main bus shall be installed with one Insulation monitor. Portable Ground Fault Detector shall be used for detection of earth fault in the corresponding feeder.

3.4.2 ONLINE INSULATION MONITOR (IM) :

3.4.2.1 The function of insulation monitor shall be to monitor the insulation resistance of positive pole as well as negative poles of the power supply distribution circuit with respect to earth, continuously. The insulation monitor shall be designed to monitor insulation resistance on-line for system voltage range of 187 V DC to 242 V DC. The auxiliary supply at 220 VDC to the monitor shall be taken from the system being monitored. The insulation monitor shall be capable of monitoring symmetrical (on both poles) as well as asymmetrical (on one pole) insulation degradation. The insulation monitor shall be provided with means for adjustment of the response value, a test / reset button, minimum three indicators. One LED indicator for 'POWER ON' indication and other for positive and negative Pole fault indication, Alarm LEDs shall glow when the insulation value falls below preset value and flash in case of interruption of connecting leads for earth, positive/negative pole. Provision shall be made for checking the correct functioning of insulation monitor. Indicator shall be provided for display of insulation resistance values.

3.4.2.2 The range of insulation monitor shall be 1 K ohm to 10 Meg ohms minimum and shall be set at 20K ohms for initiating alarm considering the normally low IR of Battery Banks. The maximum error in response value, response time, the internal resistance and internal impedance shall be as per Table-1 of IEC-61557-8. The measuring current shall be in the range of few micro amperes. The supplier shall indicate the actual value of measuring current. In case, the insulation resistance of any of the poles with respect to earth falls below the set value, an alarm relay shall operate. The contact characteristic shall be as per Table-I of IEC -61557-8. Minimum two change over contact shall be provided which shall be programmable i.e., the operating states of the contacts can be configured either normally closed or normally open. The relay contact memory shall be programmable i.e. the status of relay contacts on fault can be stored until reset switch is pressed. The insulation monitor shall function properly for maximum system leakage capacitance of 150 microfarads.

3.4.2.3 On the occurrence of insulation fault in case of DC supply circuit, the voltage difference between protective earth and faulty pole clamps to nearly zero. To locate the ground fault, it is necessary to generate and inject a test current in the faulty loop. The inbuilt Test Device in the Insulation Monitor shall generate test current pulses through the circuit connected to the system via fault point and back to the test device.

3.4.2.4 When insulation resistance of the system falls below set value, insulation monitor activates the internal test device for generating test signal for testing both the poles of power supply in sequence. Provision shall be made for manually activating test device for single test cycle or continuous test cycles.

- 3.4.2.5 The value of the current shall depend on the size of existing insulation fault and the system voltage. The test current injected into 220 VDC circuit shall be limited to 25 mA max. There shall be LED which light up when test device is activated,
- 3.4.2.6 The test current generated by test device shall be detected by portable ground fault detector feeder-wise and portable ground fault detector further downstream. In case of multiple faults (symmetric & asymmetric)Instrument shall work accurately.
- 3.4.2.7 The Insulation Monitor should have an internal system isolating switch, which makes it possible to operate several Insulation Monitors in coupled IT systems. It must ensure that only one Insulation Monitor is actively measuring at a time, while the other devices are completely isolated from the system and waiting in standby mode for measuring permission.
- 3.4.2.8 Insulation monitor shall continuously monitor insulation of system against earth. It shall measure voltage, frequency and capacitance w.r.t earth. It shall have a buffered real time clock with history memory and a graphical for representation of insulation resistance over time. It shall have pre-set measurement profiles for different applications and have commissioning wizard as standard.
- 3.4.2.9 Provision shall be made in Insulation Monitor for connecting through RS-485 two wire serial communications to Gateway for control and transfer of information. Provision shall be made to set different addresses in the Insulation Monitor.

3.4.3 PORTABLE GROUND FAULT DETECTOR (PGFD) :

- 3.4.3.1 The portable ground fault detector shall consist of a hand held clamp-on sensors, hand held fault detector (evaluator) and battery charger. The sensor shall be clamped on the feeder. When the fault current generated by test device shall pass through the sensor, the detector shall give audio visual indication so long as the fault current shall flow through the sensor. As the sensor shall cross the fault location the audiovisual indication shall stop and thus shall locate the fault.
- 3.4.3.2 Sensitivity of portable ground fault detector shall be such that it can detect a fault resistance of 20 K ohm in a feeder. The hand held detector shall be provided with liquid crystal display and shall be driven by rechargeable batteries.
- 3.4.3.3 The following displays at least shall be provided:
 - 3.4.3.3.1. Charge level of batteries.
 - 3.4.3.3.2. Audible alarm functioning status.
 - 3.4.3.3.3. clamp-on sensor not connected.
 - 3.4.3.3.4. Test current value exceeded and
 - 3.4.3.3.5. Response value exceeded indication.
- 3.4.3.4 The detector shall be menu driven and all the functions can be set through various function keys.
- 3.4.3.5 Clamp-on sensors of both sizes with internal diameter of 20mm, 52mm and 115mm shall be provided and connected to detector for detection of ground fault through flexible cords.

4. SYSTEM OBJECTIVE :

The on-line insulation monitoring system shall measure on-line, the insulation resistance of unearthed power supplies (IT systems) and on-line locate earth fault up to individual feeder level for power as well as control voltage circuits. It shall be suitable for universal use in 3-phase AC, AC/DC with rectifiers and DC systems. The on-line insulation monitoring and earth fault location system with compact/small size, low weight, functionally integrated devices with less number of components will be preferred.

The specification for On-line Insulation Monitoring and Earth Fault Location System shall completely match the following requirements:

4.1 SYSTEM DESIGN : The on-line insulation monitoring system shall consist of one or more insulation monitor operating on adaptive bi-directional clock pulse with minimum measurement current for universal AC & DC application in the system frequency range DC to 400 Hz and one or several insulation fault evaluators with the associated high sensitive measuring current transformers i.e., It shall work on AMP⁺ (Adaptive Measuring Pulse) Principle. A dedicated display system shall also be provided in the control room. Information exchange between the insulation fault evaluators and the insulation monitor & display system shall takes place via a time and cost-saving RS-485 interface. Such a system may include up to 90 insulation fault evaluators to be connected to one insulation monitor, and one insulation fault evaluator shall have up to 12 channels (feeders) to be monitored with the help of the high sensitive current transformer so that a total of 1080 circuit feeders can be monitored. This will ensure future upgradeability, flexibility and cost saving.

4.2 ONLINE INSULATION MONITOR SYSTEM :

4.2.1 FUNCTION : When the insulation resistance between the system conductors and earth falls below the set response value, the alarm relays switch and the alarm LEDs light up. Two separately adjustable alarm relays (N/C or N/O operation) shall allow a distinction to be made between pre-warning and alarm value of insulation resistance. The measured value shall indicate on the LC display or an externally connectable measuring instrument. In this way any changes, for example when circuits are connected to the system, shall be able to recognize easily. The fault message has to be stored. Pressing the integrated reset button shall be able to reset the fault memory or through external reset button. By pressing the test button, the function of the device as well as the connections to system and earth shall be tested. By pressing the additional button provides additional information, such as the existing system leakage capacitance or device settings etc. All the above functions shall be programmable and integrated in the same device. The insulation monitor shall be able to measure on-line the insulation resistance of the complete circuit in presence of AC/DC voltages and industrial noises like EMI and harmonics without any spurious indications. Further the devices shall have self diagnostic facility to detect internal device failures.

4.2.2 DEVICE FEATURES :

- 4.2.2.1 Universal application in 3-phase AC, AC/DC with rectifiers and DC IT Systems 18...575 V
- 4.2.2.2 Response range 1 K ohm...10 M ohm
- 4.2.2.3 Facility for the indication of various parameters and the system leakage capacitance
- 4.2.2.4 Comprehensive self-monitoring function including system fault alarm relay internal/external test and reset button
- 4.2.2.5 Two separate alarm relays, N/C or N/O operation selectable.
- 4.2.2.6 Backlit LC display with 4 x 16 characters
- 4.2.2.7 Message memory, system disconnection and 0/4...20mA current output
- 4.2.2.8 Extendable to an insulation fault location system for 1080 circuits
- 4.2.2.9 User adjustable test current for insulation fault location for sensitive circuits

- 4.2.2.10 Appropriate for insulation fault evaluators
- 4.2.2.11 99 alarm messages with date and time can be stored in the data memory of the monitor
- 4.2.2.12 An integrated RS – 485 interfaces allows information exchange with other devices

4.2.3 TECHNICAL SPECIFICATION :

Insulation coordination acc. to IEC 60664-1 or equivalent

Rated insulation voltage - AC 800V

Rated impulse voltage / pollution degree - 8kV/3

Voltage ranges

System being monitored

Nominal system voltage - AC, 3-phase, DC 0-1000 V

Rated frequency DC - 1...460 Hz

Supply voltage

Supply voltage - AC/DC 24-240V

Response values

Response value (Alarm 1) - 1 k ohm...10 M ohm

Response value (Alarm 2) - 1 k ohm...10 M ohm

Relative percentage error - 0%...+10%

Measuring time - 10sec max

Hysteresis - 25% + 1k ohm

Measuring circuit

Measuring voltage - ≤ 40 V

Measuring current I_m (at $R_F = 0$ ohm) - ≤ 403 micro A

Internal DC resistance R_j - ≥ 124 k ohm

Internal Impedance at 50 Hz - ≥ 180 k ohm

Permissible extraneous DC voltage - \leq DC1060 V

Permissible system leakage capacitance – profile dependent, 0-1000 micro F

Measuring circuit for insulation fault location

Test current pulse - Adjustable 2.5-50 mA

Displays

LC display - backlit

Characters (number of characters, height) - 4x16 characters/5 mm

Display range, measuring value - 1 k ohm...10 M ohm

Relative percentage error - $\pm 10\%$

Outputs

Test/reset button - external/internal

Current output - 0/4...20mA \leq (500 ohm)

Interfaces

Interface/protocol - RS-485

Max. cable length - 1200 m

Alarm Relays

No of Relays - 3 changeover contacts: Alarm1, Alarm2

Alarm3 (device error, additionally selectable Insulation Fault evaluator)

Operating principle - N/O or N/C operation

Electrical service life, number of cycle - 12000

Rated contact voltage - AC/DC 250 V

Making/Breaking capacity - AC/DC 2 A

Contact current at DC 24 V - ≥ 2 mA (50 mW)

General data

Shock resistance IEC 60068-2-27 (during operation) - 15 g/11 ms

Vibration resistance IEC 60068-2-6 (during operation) - 1 g/10...150 Hz

Ambient temperature (during operation / during storage) - 10 °C ... +55 °C/-40 °C ... +70 °C

Climatic class acc. To DIN IEC 60721-3-3 - 3k5

Operating mode - continuous operation

Mounting - Flush mounted display oriented

Connection - plug-in screw terminal

Degree of protection, internal components/terminals (IEC 60529) - IP 30/IP 20

Degree of protection in case of door mounting - IP 40

Flammability class - UL94V-1

Product standards - IEC 61557-8, IEC 61557-9

Weight - less than 1kg

4.3 FIXED INSULATION FAULT LOCATION SYSTEM :

4.3.1 FUNCTION :

4.3.1.1 Insulation fault location shall be carried out with insulation fault evaluators with the respective high sensitive measuring current transformers. When the Insulation monitor detects an insulation fault, the insulation fault location process shall start automatically or manually. This generates an Insulation fault test current (test pulse) the maximum amplitude of which is dependent on the existing system voltage, the insulation fault and the limit value set in the device. When a low-resistance insulation faults occur, the test current is limited by this limit value which can be set via an appropriate menu. The test current shall be user adjustable in the range 2.5 mA to 50 mA for use in both power as well as control circuits. The test current pulse flows from the Insulation monitor via the live parts, taking the shortest path to the location of the insulation fault. From there it flows via the insulation fault and the PE back to the Insulation monitor. This current pulse (test pulse) is then detected by the high sensitive measuring current transformers located in the individual feeder insulation fault path, and is evaluated by the insulation fault evaluators. When the test current in the measuring current transformer exceed the response value, the associated alarm LED at the insulation fault evaluators lights up indicating the faulty feeder. This information is indicated on LC display of evaluators and also indicated on the LC display of the Insulation monitor through RS-485 by assigning the measuring current transformers to the respective feeder circuit, the faulty feeder shall be detected. The earth fault evaluator shall be able to measure on-line the test pulse current in the circuit in presence of AC/DC voltages and industrial noises like EMI and harmonics without any spurious indications. Further the devices shall have self diagnostic facility to detect internal device failures.

4.3.1.2 Insulation fault location shall start via the Insulation Monitor. Once started the insulation fault evaluator shall simultaneously scan all measuring current transformers (channels). If there are several Insulation faults location systems, then these devices shall scan simultaneously.

4.3.1.3 When the test current pulse detected by a measuring current transformer exceeds the set response value (2 mA), the alarm LED lights up, the common alarm relay shall switch and the faulty circuit is indicated as plain text on the graphical display.

- 4.3.1.4 With the fault memory is activated, the alarm message of the individual channel shall remain stored until the reset button is pressed or until a reset command is given via the RS-485 interface. When the fault memory is deactivated, the alarm message shall remain stored until the insulation fault is eliminated.
- 4.3.1.5 The on-line insulation fault location system shall be able to detect on-line the insulation fault in the circuit in presence of AC/DC voltages and industrial noises like EMI and harmonics without any spurious indications.
- 4.3.1.6 **History memory** : The device shall utilizes a history memory for failsafe storing of up to 300 measured values / events (date, time, channel, event code, measured value), so that when all data about an outgoing circuit or an area can be traced back at any time (what happened when)

4.3.2 DEVICE FEATURES :

- 4.3.2.1 Insulation fault location and residual current measurement
- 4.3.2.2 For AC, 3AC, AC/DC & DC Ungrounded system
- 4.3.2.3 Control and display function within one device
- 4.3.2.4 12 measuring channels (circuits) for measuring current transformers
- 4.3.2.5 Up to 90 evaluators in one system (1080 measuring channels)
- 4.3.2.6 Scanning time for all measuring channels 10s
- 4.3.2.7 Response sensitivity 2 mA & above
- 4.3.2.8 History memory to store 300 events
- 4.3.2.9 Two alarm relays with one changeover contact each
- 4.3.2.10 N/O or N/C operation, selectable
- 4.3.2.11 Connection external reset/test button
- 4.3.2.12 Indication via graphical display, 7-segment display and alarm LEDs
- 4.3.2.13 User addressing range 1...90 or equivalent
- 4.3.2.14 Serial RS-485 interface
- 4.3.2.15 Continuous CT connection monitoring
- 4.3.2.16 Fault memory behavior selectable
- 4.3.2.17 Additional residual current measurement

4.3.3 TECHNICAL SPECIFICATION :

Insulation coordination acc. to IEC 60664-1 or equivalent
 Rated insulation voltage - AC 250V
 Rated impulse voltage / pollution degree - 4kV/III

Supply voltage

Supply voltage - AC/DC 24-240V AC, AC 50...400 Hz

Response values

Test current response value - 2 to 10mA

Measuring circuit

Nominal System Voltage Un AC 0-690V, DC 0-1000V
 External Measuring current transformers W..., WR..., WS...
 CT Monitoring on/off (on)
 Load 10 ohms
 Rated insulation voltage (Measuring current transformer) 800V
 Response sensitivity 2 to 10mA
 Rated frequency 50/60/400Hz
 Measuring range EDS function 2 to 50 mA
 Measuring range RCM function 100mA to 10A

Number of measuring channels (per device/system) 12/1080

Specified time

Response delay t_{on} 0-24S

Release delay t_{off} 0-24S

Scanning time for all channels approx 6-10S

Measuring current transformer connection

Single wire ≥ 0.75 Sqmm 0 to 1m

Single wire, twisted ≥ 0.75 Sqmm 1 to 10m

Shielded cable ≥ 0.5 Sqmm 10 to 40m

Recommended cable J-Y (ST) Y min. 2x0.8

Displays

LEDs ON/ALARM

LC display – backlit graphical display

7-segment display 2x7.62 mm

History memory 300 data records

Outputs

Test/reset button - external/internal

Cable length for Test/reset button 0 to 10 m

Interfaces

Interface/protocol - RS-485

Max. cable length - 0 to 1200 m

Alarm Relays

No of Relays - 2 relays with one changeover contact each

Operating principle - N/O or N/C operation

Electrical service life, number of cycle - 10.000

Rated contact voltage - AC 230V / AC 230V / DC 24V / DC 110V / DC 220 V

Rated operational current - AC 5A / AC 3A / DC 1A / DC 0.2A / DC 0.1A

Minimum contact load - 1mA at AC/DC 10V

General data

EMC IEC 61326

Operating temperature -25 °C to +55 °C

Climatic class acc. To DIN IEC 60721-3-3 - 3k5

Classification of mechanical condition IEC 60731 3M4

Connection - screw-type terminal

Degree of protection, internal components/terminals (IEC 60529) - IP 20

Enclosure material Polycarbonate

Flammability class - UL94V-0

Product standards - IEC 61557-9

Weight - ≤ 360 g

4.4 SENSITIVE CURRENT TRANSFORMERS SYSTEM:

4.4.1 FUNCTION : The highly sensitive current transformers shall be designed to measure the very low test pulse currents sent by insulation monitor through the earth faults and shall be evaluated by evaluators to detect the earth fault in a feeder. The current transformers shall work on core balance principle (i.e., CTs shall be CBCT (Core Balance Current Transformer) type). The current transformers shall be designed to measure the test pulse residual currents from 2 milliamps up to 10 Amps in the primary feeder. The current transformers shall be available in various sizes to accommodate feeder cables of various sizes.

4.4.2 DEVICE FEATURES :

4.4.2.1 Current transformers shall highly sensitive measuring current transformers with minimum response value of 2mA.

4.4.3 TECHNICAL SPECIFICATION :

Insulation co-ordination acc. to IEC 60664-1 or equivalent

Rated insulation voltage - 800V

Rated impulse voltage/pollution degree - 8kv/III

Rated primary residual current - 2mA...10 A

Frequency range - 42Hz...3kHz

Rated continuous thermal current - 40A

Environment

Operating temperature : -10°C..+50°C

Climatic class acc. to IEC 60721

Stationary use (IEC 60721-3-3) - 3K5(except condensation and formation of ice)

Classification of mechanical conditions IEC 60721

Stationary use (IEC 60721-3-3) - 3M4

Degree of protection, internal components (DIN EN 60529) - IP40

Degree of protection, terminals (IEC60529) - IP20

Screw mounting with mounting brackets

Flammability class - UL94V-0

Product standards - IEC 60044-1

4.5 PORTABLE INSULATION FAULT LOCATION SYSTEM :

4.5.1 FUNCTION :

4.5.1.1 The portable Insulation fault location system shall be designed to locate insulation faults on-line in unearthed systems (IT systems). The portable Insulation fault location system shall be designed to be used in AC/DC 18...575 V in presence of harmonics. The robust aluminum case shall be light to carry & incorporate insulation fault test device, handheld evaluator, with different types of current clamps, connectors, battery chargers etc. The portable insulation fault location system shall be able to detect on-line the insulation fault in the circuit in presence of AC/DC voltages and industrial noises like EMI and harmonics without any spurious indications.

4.5.1.2 Portable insulation fault test device has to be activated; the measuring clamps of the portable evaluator which are placed around all conductors of the individual circuits (With the exception of PE, Shield or armour). When the measuring value in a faulty sub circuit exceeds the response value, the alarm LED lights up and an audible signal sounds. The value of the test current has to be indicated on the display. The alarm message shall be stored. Not only can current clamps must be used to detect the measuring values, but also permanently installed or split\core measuring current transformers.

4.5.1.3 **Display :** The LC display shall indicate the measured value of the test current, the type of the connected measuring current transformers, Current clamps, the accumulator capacity, the activation of the alarm memory, the activation of the buzzer, and the set nominal frequency.

4.5.2 DEVICE FEATURES :

4.5.2.1 Insulation fault location system for IT systems AC/DC 18...575 V

4.5.2.2 Response values : 2-10mA

4.5.2.3 LC display

- 4.5.2.4 Alarm LED
- 4.5.2.5 Switchable operating mode : insulation fault location/residual current measurement.
- 4.5.2.6 Supplied battery and accumulator
- 4.5.2.7 Accumulator charging set included in the scope of delivery.
- 4.5.2.8 Current measuring clamps 20,52 and 115 mm
- 4.5.2.9 Residual current measurement 10mA...10A
- 4.5.2.10 Portable insulation fault test device.
- 4.5.2.11 Aluminium carry case

4.5.3 TECHNICAL SPECIFICATION :

Rated insulation voltage - 50V
 Rated impulse voltage/pollution degree - 0.8kV/3

Voltage Range

Storage battery charger - AC 100...240V

Evaluating current

Evaluating current - 0.2 to 50mA

Response value

Test current response value min - 0.2 ... 1 / 2 ... 10mA
 Test current response value min -2...10mA for main circuits
 Response value residual current measurement 10mA...10A

Display

LC Display - LC 3 X 16 characters
 LED - Alarm

General Data

Shock resistance IEC 60068-2-27 (during operation) - 15g/11ms
 Vibration resistance IEC 60068-2-6 (during operation) - 1 g/10.... 150Hz
 Ambient temperature (during operation) - 10°C ... +55°C
 Climatic class acc. To DIN IEC 60721-3-3 - 3K5
 Operating mode - continuous operation
 Mounting - any position
 Degree of protection acc. To DIN EN 60529 - IP 20
 Flammability class - UL94V-0
 Product Standards - IEC 61557-9
 Weight - < 8 Kg

4.5.4 MEASURING CLAMPS

Electrical safety

Standard IEC 61010-2-030
 Pollution degree 2
 Installation category III
 Operating voltage 600V
 Nominal insulation voltage AC 600V CAT III bzw. AC 300V V CAT IV

Transformation data

20mm measuring clamp 10A/10mA
 52mm measuring clamp 10A/10mA
 115mm measuring clamp 10A/10mA

Other

Degree of protection IP40
 Protection class acc. to IEC 60947-1 class III
 Test port BNC plug
 Approx dimension of 20mm measuring clamp 135x65x30mm

Approx dimension of 52mm measuring clamp 216x111x45mm
Approx dimension of 115mm measuring clamp 285x179x45mm
Approx weight of 20mm measuring clamp ≤300g
Approx dimension of 52mm measuring clamp ≤700g
Approx dimension of 115mm measuring clamp ≤1300g

5.0 Warranty/Guarantee:

The system shall be guaranteed for any defects for minimum 36 months from date of successful demonstration at site. If the kit needs to be shifted to suppliers works for repairs, supplier will have to bear the cost of, spares, software, transportation etc of system for repair at test lab/works. The commencement of warranty period will start after the successful and final demonstration, inclusive of repetitive if any, of System at site. All the materials, including accessories, cables, etc. are to be covered under warranty/ guarantee period.

1. If any problem in the system is reported in the guarantee period, then the kit shall be collected by the firm within ten days of the report of problem for free repairs and the transportation/transit insurance cost shall also be borne by the supplier.
2. Repair period shall be maximum of one month from the date of system collected by the firm.

Any period over and above (as 1 & 2 above), stipulated time shall be liable to extend the guarantee period for the delay period for which firm shall arrange to extend the Bank Guarantee.

6.0 Training :

Supplier shall have to ensure that the system is made user friendly. Apart from detailed demonstration at site, the supplier shall also have to arrange necessary training to end user engineers at different sites of destination.

7.0 Test Certificate :

All the applicable test reports as per **IEC-61557-8 & 9** shall be furnished

8.0 Commissioning, Handing over the Instrument:

Successful bidder will have to commission the instrument to the satisfaction of end user.

9.0 Service :

Bidder will have to submit the documentary evidences of having established mechanism for prompt services in India as required as per the specifications. The service support including supply of spares shall be ensured for a period of minimum 10 years.

TYPICAL ARCHITECTURE

Online Insulation Monitoring System with Fixed Fault CT location System for 110V/220V DCDBS

