

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGER, LUCKNOW – 226011



SPECIFICATION FOR EARTH LEAKAGE DETECTION AND EARTH FAULT LOCALIZATION SYSTEM

Specification No - No. RDSO/SPN/256/2025
Version: 2.0

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 1 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

DOCUMENT DATA SHEET	
RDSO/SPN/256/2025, Version-2.0	
Title of Document: Specification for Earth Leakage Detection and Earth Fault Localization System	
Prepare By: Name: Shri Akhilesh Kumar Tripathi Designation: JE/D/S&T	AKHILESH KUMAR TRIPATHI Digitally signed by AKHILESH KUMAR TRIPATHI DN: cn=, PostalCode=226011, st=UTTAR PRADESH, STREET=LUCKNOW, L=LUCKNOW, O=MINISTRY OF RAILWAYS, G=MINISTRY OF RAILWAYS, SERIALNUMBER=+44F7B8155507508996d9fc2b5aa242500770b51a0851388f409d9fed, OID.2.5.4.65=77a89d45a0b4867d443b3a4009c, Phone=+919656581440481003050460000215a050a45471518518ba0a0098, E=AKHILECCT31@GMAIL.COM, CN=AKHILESH KUMAR TRIPATHI I am the author of this document. Location: Date: 2025.07.30 12:18:29 +05'30' File: PDF Reader Version: 2024.4.0
Checking By: Name: Shri Ved Prakash Designation: Jt.Director/Signal-I/RDSO	VED PRAKASH Digitally signed by VED PRAKASH Date: 2025.07.30 12:16:43 +05'30'
Reviewed By: Name: Shri Amit Kumar Designation: ED/Signal-III/RDSO	AMIT KUMAR 2025.07.30 12:20:34 +05'30'
Approved By: Name: Shri Suresh Kumar Designation: Principal ED/S&T/RDSO	SURESH KUMAR Digitally signed by SURESH KUMAR Date: 2025.07.30 16:20:51 +05'30'
Abstract: This document defines Specification for Earth Leakage Detection and Earth Fault Localization System.	

AKHILESH KUMAR TRIPATHI Digitally signed by AKHILESH KUMAR TRIPATHI DN: cn=, PostalCode=226011, st=UTTAR PRADESH, STREET=LUCKNOW, L=LUCKNOW, O=MINISTRY OF RAILWAYS, G=MINISTRY OF RAILWAYS, SERIALNUMBER=+44F7B8155507508996d9fc2b5aa242500770b51a0851388f409d9fed, OID.2.5.4.65=77a89d45a0b4867d443b3a4009c, Phone=+919656581440481003050460000215a050a45471518518ba0a0098, E=AKHILECCT31@GMAIL.COM, CN=AKHILESH KUMAR TRIPATHI I am the author of this document. Location: Date: 2025.07.30 12:18:29 +05'30' File: PDF Reader Version: 2024.4.0		VED PRAKASH Digitally signed by VED PRAKASH Date: 2025.07.30 12:16:43 +05'30'	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 2 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

DOCUMENT CONTROL SHEET

NAME	ORGANISATION	FUNCTION	LEVEL
Shri. Akhilesh Kumar Tripathi JE/D/S&T	RDSO	Member	Prepare
----- ADE/Sig-I	RDSO	Member	Checking
Shri. Ved Prakash Director/Sig-I	RDSO	Member	Checked & Recommended
Shri. Amit Kumar ED/Sig-III	RDSO	Member	Reviewing Authority
Shri Suresh Kumar PED/S&T	RDSO	Member	Approving Authority

 AKHILESH KUMAR TRIPATHI		 VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 3 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

AMENDMENTS:

Specification No.	Version	Amendment	Amendment details	Effective date
RDSO/SPN/256/2002	1.0	First	---	2002
RDSO/SPN/256/2024	1.1 D0	Draft	Updated as per the new requirement from the preventive maintenance of S&T	16.10.2024
RDSO/SPN/256/2024	1.2 D0	Draft	Updated as per the comment received from OEMs and Zonal Railways and Field Unit.	14.01.2025
RDSO/SPN/256/2024	1.3 D0	Final Draft	Updated as per the comment received from OEMs and Zonal Railways and Field Unit.	09.05.2025
RDSO/SPN/256/2025	2.0		Updated as per the comment received from OEMs and Zonal Railways and Field Unit.	As signed.

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 4 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

Table of Content

SN	Chapter	Page No.
0.	Foreword	6
0.5	Definitions	6
1.	Scope	7
2.	General Requirements	7
3.	Functional Requirements	9
4.	System Requirements	12
5.	Climatic Requirements	14
6.	Inspection And Testing	15
7.	Materials, Construction and Workmanship	17
8.	Markings and Packing.	18
9.	Information to be furnished by Purchaser.	18

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 5 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

0 FOREWORD

0.1 This specification is issued under a fixed serial number RDSO/SPN/256/2025. The final number indicates the year of original adoption as standard or in the event of revision, the year of last revision.

0.2 This specification requires reference to the following specifications which shall also be complied with to the extent applicable:

IEC 61557-8: Insulation monitoring devices for IT systems.

IEC 61557-9: Equipment for insulation fault location in IT systems.

IRS-S:23: Specification for Electrical Signalling and Interlocking equipment.

IS-9000: Basic environmental testing procedure for electronic and electrical items.

IS- 6297: General requirements for transformers and indicators for Electronic equipment's.

ISO 9001:2015 Quality management system-requirement.

0.3 Whenever in this specification any of the above mentioned specifications are referred to by number only without mentioning the year of issue, the latest issue of the specification is implied.

0.4 This specification is intended chiefly to cover the technical provisions and provisions relating to the supply of the equipment and does not include provisions of a contract.

0.5 Definitions:

A- **Earth leakage Detector/Channel/Module (ELD):** Individual detecting circuits used for the detection of the earth leakage/faults in signaling circuits and cable.

B- **Detecting current:** Current injected by the Earth fault detecting circuit between the signaling system and earth.

C- **Earth Leakage resistance (R_x):** The resistance of the signaling system connected to one detecting circuit bus bar with respect to earth.

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 6 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

- D- **Set reference value (R_0):** Reference value of earth leakage resistance set by user for each detecting circuit (channel) to initiate the alarm.
- E- **Response value (R_1):** The value of earth leakage resistance at which the ELD gives alarm. Its maximum value is 110% of set reference value i.e. $R_0 < R_1 \leq 1.1R_0$.
- F- **Reset value (R_2):** The earth leakage resistance value at which ELD can be reset. Its maximum value is 105% of response value i.e. $R_1 < R_2 \leq 1.05R_1$.
- G- **Insulation fault/earth fault:** Symmetrical or asymmetrical defect in the insulation where Leakage resistance fall to the set reference of Leakage resistance of "critical alarm" or "decay alarm".
- H- **Reset:** When Leakage resistance improve over to the response value (R_1) in case of "critical alarm" or "decay alarm".
- I- **Level-1 ELD:** Conventional ELD for the detection of the earth faults in signaling circuits/cable before revision in this specification.
- J- **Level-2 ELD:** Digital ELD with feature such as -Digital display, event logging, auto-resetting and centralized monitoring, as conceptualized in the different clause of this specification.
- K- **Level-3 ELD:** Level-2 Digital ELD with fault localization features as conceptualized in the different clause of this specification.

1 Scope

This document specifies the technical requirement of Earth Leakage Detection (ELD), Earth Fault Localization Systems (EFLS) for monitoring leakage resistance and detecting earth faults in signaling circuits and localize earth faults in any part of the signaling system.

2 General Requirements

- 2.1 The ELD & EFLS case shall have a vermin-proof industrial grade case, suitable for rack/panel mounting, complete with fixing lugs and screws. All components shall be rigidly fixed and shall withstand normal shock and vibrations.
- 2.2 For Level-1: The ELD & EFLS case shall be finished in stove enamel grey paint /gray colour powder coating and all parts shall be protected from rust and corrosion as applicable.

For Level-2 & above: The ELD & EFLS case shall be finished in gray colour powder coating and all parts shall be protected from rust and corrosion as applicable.

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 7 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

- 2.3 The basic detector unit/cabinet shall comprise of 4/6/8/12 channels, for use on signalling circuits of 110V AC and/or 110V/60V/24V/12V DC. If the detector is required for less number of channels, dummy plates shall be provided. For additional requirement add on /expendable cabinet may be used. The voltage specified shall be provided with + 25% and – 10% tolerance.
- 2.4 The ELD & EFLS cabinet shall preferably be suitable for mounting in panel/19" rack.
- 2.5 The individual detecting circuit (channels) unit shall be plug-in type or modular in design.
- 2.6 Switches, knobs, push buttons, lamp indicators, meters terminals, resistances, capacitors, counters and other components shall be of industrial grade. Mounting of these components shall be elegant and easy for operation, adjustment and maintenance.
- 2.7 All component and wirings shall be easily accessible for maintenance but no electrical conducting part shall be accessible externally. Arrangements for proper ventilation of all heat radiating components shall be provided.
- 2.8 For Level-3: Earth fault localization system (EFLS) usually consists of (a) Locating Current Injector (LCI): Stand alone or as part of the ELD. (b) Insulation Fault Locator: Portable (PIFL) or permanently installed (IFL) stand alone or as part of the ELD. (c) Locating Current Sensor (LCS): Connected to the PIFL or IFL as the case may be.
- 2.9 Where common display is used in ELD, a suitable rotary switch or user-friendly switching arrangement shall be provided to connect the leakage resistance meter to any of the detecting circuits (channel) one by one.
- 2.10 During the normal course of working of signaling installations, different signaling circuits in varying combinations get switched on and off from the power supply. The insulation resistance and capacitance of the system is therefore variable and hence it is essential that the ELD & EFLS, once adjusted at the time of installation, remains stable and does not give false alarms either with varying signaling circuit combinations or during their switching period.
- 2.11 The ELD & EFLS shall not be affected by disturbances applied to the system such as induced voltages from lightning or traction currents.
- 2.12 In the event of failure of power supply to the detector/channel, the detector shall re-indicate the earth faults as soon as the power supply is restored.

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 8 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

2.13 For Level-1: The working of the detector/channel shall not be affected by the capacitance to earth of the associated signaling circuits which may be up to 5 mfd.

For Level-2 & above: The working of the detector/channel shall not be affected by the capacitance to earth of the associated signaling circuits which may be up to 10 mfd.

2.14 The ELD & EFLS shall be suitable for use in 25 KV, 50Hz single phase AC electrified sections and shall be immune to the effects of 50 Hz AC voltages to the extent of 750 V.

2.15 The AC test voltage of 750 V shall be applied abruptly between the conductors of the signaling circuit and earth.

2.16 All the components of the ELD & EFLS shall be suitably rated to cater for over voltages and short circuit/dead earth conditions and for continuous operation.

2.17 The ELD & EFLS shall be suitable for working on any one of the power supplies of 230 V AC, 110 V AC, 110 V DC with $\pm 15\%$ tolerance.

2.18 A visual indication shall be provided in ELD to indicate the presence of the main power supply.

2.19 The dielectric strength between insulated and metallic parts shall withstand 2000V (rms) 50Hz AC for one minute. The leakage current measured during this test shall not exceed 1 milli-amps.

2.20 The insulation resistance between insulated and metallic parts shall not be less than 50 mega ohms at 500V DC.

2.21 For Level-3: Earth fault localization system (EFLS) shall be capable of localizing symmetrical as well as asymmetrical insulation faults in a signalling system at cable conductor level and to give a warning, whenever the insulation resistance in a part of the installation falls below the set reference value (R_0). If equipment for insulation fault location has a self-test function, the self-test shall not produce an insulation fault to earth.

2.22 For Level-3: In the locating current injector, the locating current shall be generated by an independent active voltage or current source inside the test device.

3 Functional Requirements

3.1 For Level-1: Audio alarm circuit of the ELD shall be common to all the detecting circuits. Individual visual indication shall be provided for each detecting circuit.

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 9 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

For Level-2 & above: The leakage detecting relay shall be separate for "critical alarm" and "decay alarm" for each detecting circuits.

- 3.2 An industrial grade push button or any suitable arrangement shall be provided to mute the alarm buzzer.
- 3.3 For Level-1: A manual reset button of industrial grade for each detector/channel shall be provided to re-energise the detecting relay/means ("critical alarm") after an earth fault has been indicated. The equipment shall be RESET by pressing push button switch, only after the fault has been rectified.

For Level-2 & above: Auto resetting facility shall be provided to re-energise the detecting relays of "critical alarm" and "decay alarm" after an earth fault has been indicated. Auto resetting shall take place only after leakage resistance has increased above reference set values (R_0) for critical and decay alarms. There shall be option to select between auto resetting and manual resetting.

- 3.4 For Level-1: Each RESET operation shall be recorded by a non-resettable counter or any other suitable means.
- 3.5 For Level-1: ELD shall have a leakage resistance meter which can be connected by a rotary switch or any other suitable arrangement to each individual detector/channel to indicate the actual value of the leakage resistance (R_x) in Kilo-ohm/Mega-ohm. The leakage resistance meter shall be of wide scale aperture type. The accuracy of the reading shall be within $\pm 2.5\%$ at the center of the scale. It shall be possible to read the leakage resistance of the bus bar up to 4 Mega Ohm or higher.

For Level-2 & above: ELD shall have facility to measure and display the actual value of the leakage resistance (R_x) of bus bar in Kilo-ohm/Mega-ohm of each detecting circuits. Where common display meter is used then there shall be a suitable arrangement to connect to each individual detector/channel to indicate the actual value of the leakage resistance. The accuracy of the reading shall be within $\pm 10\%$ at the actual value (R_x) of the leakage resistance. It shall be possible to read the leakage resistance of the bus bar up to 4 Mega Ohm or higher.

- 3.6 For Level-2 & above: There shall be a indication/display for earth connectivity/dis-connectivity of each detector/channel.
- 3.7 For Level-2 & above: Where common digital display is provided for all the detection circuit, there shall be a digital display for ELD to display at least

(a) Channel number/Id

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 10 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

(b) the actual measured value (R_x) of the leakage resistance of each detector in Kilo-ohm/Mega-ohm minimum up to 4 Mega ohm or higher

(c) the set reference value (R_0) of each detector/channel for "critical alarm" and "decay alarm"

(d) The details of last events of "critical alarm" and "decay alarm" shall be serially displayed with minimum count upto 1023 for each channel.

Where digital display is provided for each detection circuit, it shall display

(a) The actual measured value (R_x) of the leakage resistance of detector in Kilo-ohm/Mega-ohm minimum up to 4 Mega ohm or higher

(b) The set reference value (R_0) of each detector for the decay and critical alarms

(c) the details of last events of "critical alarm" and "decay alarm" shall be serially displayed with minimum count up to 1023.

Parameter from (a) to (c) are to be displayed continuously, when ELD is functional in both type of displays. Remaining information may be access by menu.

3.8 For Level-2 & above: Where ELD has a common digital display for all channel/detector. It shall display according to the clause no-3.7 on sequential scrolling basis with 10 second display for each channel. There shall be suitable means to "ON and OFF" the scrolling and to connect each individual channel, which shall enable only in off scrolling mode.

3.9 For Level-2 & above: Digital display shall meet the following requirements in general or better- (a) Type - LCD Display (b) Number of characters 20 x 4. (c) 5*8 Dot matrix type.

3.10 For Level-2 & above: The ELD shall have feature of event logging as mandated in clause 3.7(d). Other event may also be logged in the line of:

(a) Each leakage earth fault event detected along with channel number, date & time, actual measured leakage resistance, set reference value (R_0), reset date and time, whether auto or manual and reset count number.

(b) Bus bar availability & unavailability event with date and time along with channel number.

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 11 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

(c) System powering on & off event with date and time.

(d) Earth connectivity & dis-connectivity event of each channel with channel number, date and time.

(e) Maximum and minimum value of actual measured value (R_x) of the leakage resistance over a period of 24 hour along with channel number, date & time.

3.11 For Level-2 & above: ELD shall have provision for the display of the logged events in the display unit and shall have provision for access/downloading the complete log file to external device.

3.12 For Level-3: ELD shall have necessary communication arrangement for the centralized monitoring by utilizing the communication media used in Indian Railways. There shall be Graphic User Interface (GUI) for the centralized monitoring of the ELD.

4 System Requirements

4.1 The detecting circuit shall adopt superimposition methodology for detecting earth faults in signalling cables and circuits without disturbing the running circuits on them.

4.2 One end of the detecting circuit shall be connected through a high resistance network to the two conductors of the signaling circuit(s) and the other end of the detecting circuit shall be connected to earth. It shall detect total leakage from the bus bars or the conductors to earth, whether the leakages are "equal or unequal" OR "symmetrical or asymmetrical" from one or both the conductors or from the center point of the transformer supply of the bus bars or the termination transformer connected to the conductors.

4.3 The network resistance connected between the conductors shall be such as not to cause a drain more than 200 micro amperes.

4.4 The DC or AC voltage on the bus bar/ conductor, for which earth leakage detector/channel is required, shall be indicated by the purchaser.

4.5 The peak value detecting current shall not exceed 500 micro-Amps for detecting circuits /IR tester.

For Level-3: The peak value Locating current shall be limited to 10-20 milli-Amps for fault locator current injector with suitable facility to adjust the same.

4.6 For Level-2 & above: The peak value of the voltage of detecting circuits and locating circuits shall not exceed 120V. The detecting

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 12 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

voltage shall be applied symmetrically (the phase and the amplitude) on both limb of the circuit under detection.

- 4.7 A separate lockable Pot or any other suitable means (individual or common) shall be provided for each detector/channel to set the leakage for "critical alarm" value as a reference value (R_0) from 2 Kilo-ohm to 1 Mega-ohm or higher.
- 4.8 For Level-2 & above: A lockable Pot or any other suitable means (individual or common) shall be provided for each detector/channel to set the reference value (R_0) of leakage resistance for pre-warning "decay alarm" from 2 Kilo-ohm to 1 Mega-ohm or higher. Set reference value (R_0) for "decay alarm" shall always be set greater than the "critical alarm".
- 4.9 For Level-2 & above: It should be possible to set the set reference value (R_0) for "critical alarm" and "decay alarm" at a value below the actual value (R_x) of earth leakage resistance (healthy) within the range specified in clause-4.7 & Clause-4.8 respectively.
- 4.10 For the response value (R_1) of the ELD, The accuracy of operation of the detector should be such that the detection/alarm commence at +10% of the set reference value (R_0) of leakage resistance i.e. **$R_0 < R_1 \leq 1.1R_0$** e.g. if 500k is the set reference value (R_0), then alarm start appearing for earth leakage resistance value equal to 550K or below.
- 4.11 For Level-1: In case of DC channel detector, accuracy of operation is adjusted to meet the upper limit of accuracy for one polarity of the battery.

For Level-2 & above: In case of earth fault, ELD shall indicate the limb (positive and/or negative) in which the earth leakage fault has occurred. In case of AC/DC channel detector, accuracy of operation shall be adjusted to meet the upper limit of accuracy for both limb of the signaling circuit.
- 4.12 Ideally the reset value shall be more than response value (R_1). However, the reset value (R_2) of the leakage resistance shall not be more than +5% of the response value (R_1) i.e. **$R_1 < R_2 \leq 1.05R_1$** . For set reference value (R_0) lower than 50K, the reset value (R_2) shall not be more than **1K+5%** of the response value (R_1).
- 4.13 In case, relay are used for detection circuit for "critical alarm" and "decay alarm", such relay shall be of industrial grade.
- 4.14 At least one spare front & back contact shall be made available in the "critical alarm" detecting relays and "decay alarm" detecting relay for monitoring of visual and audible indications through datalogger.

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 13 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

4.15 The "critical alarm" detecting relay and "decay alarm" detecting relay (s) shall normally remain energized and get de-energized when the present earth fault is detected.

4.16 The relay, once de-energized, shall remain in that condition until it is reset as per clause-4.12.

4.17 For Level-1: The detector shall be capable of giving visual and audible indications for "critical alarm".

For Level-2 & above: The detector shall be capable of giving visual and audible indications for "critical alarm" and "decay alarm".

4.18 For Level-1: ELD shall be capable of detecting and indicating its internal faults of the equipment by giving audible and visual indication.

For Level-2 & above: There shall be independent indication for each channel in the ELD for indicating its internal faults by giving audible and visual indication.

4.19 The disconnection of Earth or bus bars shall result into fault condition.

4.20 To indicate the correct working of the detector and normal condition of ELD circuits, an indication e.g. by a green light on each channel shall be provided.

4.21 Design of equipment's shall be such that failure of any component shall not extend earth to signaling circuit.

4.22 The transformers used in the detector shall conform to IS:6297.

4.23 For Level-2 & above: Response time i.e. time required by an earth leakage monitoring device to respond to the leakage resistance changes shall not exceed 10 seconds irrespective of the supply voltage of the signaling circuit under detection.

5 Climatic Requirements

5.1 The ELD & EFLS shall function satisfactorily under the following climatic severities. The tests shall be as per IS: 9000:

Sl No	Test	Remarks
i)	Cold	-10 ⁰ C
ii)	Dry Heat	+50 ⁰ C

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 14 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

iii)	Damp Heat (long term exposure)- during 10 days	+37°C ±2°C
iv)	Relative Humidity	95 to 100%
v)	Damp Heat (accelerated)- 2 cycles of 24 hrs. Each followed by an assisted recovery at +55°C for 24 hrs	Pass
vi)	Dust	Pass: Duration 4 hours

6 Inspection And Testing

- 6.1 Inspection and testing shall be carried out to ensure that all requirements of this specification and other specifications referred to are complied with.
- 6.2 The manufacturer shall provide all facilities for testing the equipment according to this specification and shall conform to general requirements of inspection and testing of IRS:S:23 to the extent applicable.
- 6.3 Visual Examination - The ELD & EFLS shall be visually examined for compliance with the requirements specified in Clauses 2, 3, 4, 7 and 8.
- 6.4 **Type Tests** - The following shall constitute the type tests for ELD & EFLS as applicable:
- a- Visual examination (Clause 6.3)
 - b- Conformity with dimensions (Clause 2.4)
 - c- Tests on operation of detection and localization (Clause 3.1 to 3.3 and 4.13 to 4.17 and 4.23)
 - d- Tests to check counter, Leakage detection and accuracy of the setting (Clause 3.4 to 3.5 and 4.2 to 4.12)
 - e- Stability of operation (Clause 2.10 to 2.13)
 - f- Test on earth connectivity and display (Clause 3.6 to 3.12 as applicable)
 - g- Test on earth fault localization system (Clause 2.8 and 2.20 to 2.21)
 - h- AC Immunity Test (Clause 2.14 to 2.15)

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 15 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

- i- Fail safe features and internal fault indication (Clause 4.18 to 4.21)
 - j- Rating (Clause 2.16 to 2.20)
 - k- Tests on power supply (Clause 2.17 & 2.18)
 - l- High Voltage Test (Clause 2.19)
 - m- Insulation Resistance Test (Clause 2.20)
 - n- Climatic Test (Clause 5)
 - o- Performance tests: The purchaser or his nominee shall conduct performance tests to check the functioning of earth leakage detector by actually installing it on signaling circuit in field.
- 6.5 The manufacturer shall submit two representative samples to the purchaser or his nominee for tests for all the specified requirements for type approval. Bulk manufacturing shall be undertaken only after the type approval has been communicated to the manufacturer as per Clause 14.1 of IRS:S:23.
- 6.6 Criteria for approval: The sample shall successfully pass all the type tests for proving conformity with the requirements for this standard. If the sample fails in any of the type tests, the testing authority may, at its discretion, call for fresh samples, not exceeding twice the original number and subject them again to all tests or to the test(s) in which failure(s) occurred. No single failure shall be permitted in the repeat test(s).
- 6.7 **Routine Tests** - The following shall constitute the routine tests which shall be carried out by the manufacturer on each individual earth leakage detector:
- a- Visual examination (Clause 6.3)
 - b- Tests on operation of detection and localization (Clause 3.1 to 3.3 and 4.13 to 4.17 and 4.23)
 - c- Leakage detection (Clause 4.2 to 4.12)
 - d- Tests on power supply (Clause 2.17 to 2.18)
 - e- Test on (Clause 3.6 to 3.12 as applicable)
 - f- Test on earth connectivity and display (Clause 3.6 to 3.12 as applicable)
 - g- Test on earth fault localization system (Clause 2.8 and 2.20 to 2.21)
- 6.8 Before offering the materials for inspection, the manufacturer/supplier shall test each detector to ensure that all the requirements of this specification are satisfied. A copy of the test results shall be furnished to the inspecting authority.

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 16 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

- 6.9 **Acceptance Tests** - The following shall constitute the acceptance tests which shall be carried out by the inspecting authority for the purpose of acceptance of the lots offered for inspection by the supplier:
- a- Visual examination (Clause 6.3)
 - b- Conformity with dimensions (Clause 2.4)
 - c- Tests on operation of detection and localization (Clause 3.1 to 3.3 and 4.13 to 4.17 and 4.23)
 - d- Tests to check counter, Leakage detection and accuracy of the setting (Clause 3.4 to 3.5 and 4.2 to 4.12)
 - e- Leakage detection (Clause 4.2 to 4.12)
 - f- Tests on power supply (Clause 2.17 to 2.18)
 - g- Test on earth connectivity and display (Clause 3.6 to 3.12 as applicable)
 - h- Test on earth fault localization system (Clause 2.8 and 2.20 to 2.21)
 - i- Any other test(s) specified in this specification as considered necessary by the inspecting authority.
- 6.10 Each earth leakage detector offered shall be tested for acceptance.
- 6.11 The manufacturer shall provide the required testing facility.
- 6.12 Materials and workmanship These shall fulfill the requirements of Clauses 4 to 7 of IRS:S:23 to the extent applicable.

7 Materials, Construction and Workmanship

- 7.1 The design of the detector shall be economical in accordance with best engineering practice.
- 7.2 The equipment and its parts shall be of good commercial standard, robust in design convenient to handle.
- 7.3 When electronic and solid state components are employed, their quality, wiring and mountings shall conform to best modern practices.
- 7.4 The manufacturer shall supply full description of the detector, technical data and complete circuit details of the mode of operation and instructions on installation and maintenance.
- 7.5 These shall fulfill the requirements of Clauses 4 to 7 of IRS:S:23 to the extent applicable.

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 17 of 18

ISO 9001:2015	Document No- RDSO/SPN/256/2025	Version: 2.0	Date Effective: 30.07.2025
Document Title: Specification for Earth leakage detection and Earth fault localization system.			

8 Markings and Packing.

8.1 All switches/ push buttons/ knobs, indicators and terminals shall be duly marked and labeled.

8.2 For Level-1: ELD shall be provided with schematic diagram of the equipment.

For Level-2 & above: As applicable, ELD & EFLS shall be provided with equipment manual that contains the fault-finding flow chart, schematic diagram of the equipment etc.

8.3 A nameplate giving the following information as applicable shall be attached to the ELD & EFLS in a appropriate position:- (i) Manufacturer's name/logo. (ii) Specification number. (iii) Serial number (iv) Rated voltage (v) Level of ELD.

Level of ELD shall also be marked in front panel with bold letters.

8.4 The packing shall ensure that no damage occur during transport and also during storage under conditions of temperature and humidity in Clause 4.1.

9 Information to be furnished by Purchaser.

9.1 Specification number.

9.2 Level of ELD.

9.3 Number of channels.

9.4 The DC or AC voltage on the bus bar/ conductor for which earth leakage detector is required.

9.5 Requirement of Earth Fault Localization system with installation details.

9.6 Power supply requirement as per clause-2.17

END OF DOCUMENT

AKHILESH KUMAR TRIPATHI		VED PRAKASH	Printed:
Prepared By: JE/D/S&T	Checked By: ADE/Signal	Checked and Issued By: Jt.Director/Signal-I	Page 18 of 18