

SASO IEC 61557-9/2009

**ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS
UP TO 1 000 V a.c. AND 1 500 V d.c. –
EQUIPMENT FOR TESTING, MEASURING OR MONITORING
OF PROTECTIVE MEASURES –**

Part 9: Equipment for insulation fault location in IT systems

SAUDI ARABIAN STANDARDS ORGANIZATION

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SASO IEC 61557-9/2010

Foreword

The Saudi Arabian Standards Organization (SASO) has adopted the International standard No. IEC 61557-9/2007 δELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP TO 1 000 V a.c. AND 1 500 V d.c. ó EQUIPMENT FOR TESTING, MEASURING OR MONITORING OF PROTECTIVE MEASURES ó Part 9: Equipment for insulation fault location in IT systemsö. The text of this international standard has been translated into Arabic so as to be approved as a Saudi standard without introducing any technical modification.

**ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION
SYSTEMS UP TO 1 000 V a.c. AND 1 500 V d.c. –
EQUIPMENT FOR TESTING, MEASURING
OR MONITORING OF PROTECTIVE MEASURES –**

Part 9: Equipment for insulation fault location in IT systems

1 Scope

This part of IEC 61557 specifies the requirements for insulation fault location systems which localize insulation faults in any part of the system in unearthed IT a.c. systems and unearthed IT a.c. systems with galvanically connected d.c. circuits having nominal voltages up to 1 000 V a.c., as well as in unearthed IT d.c. systems with voltages up to 1 500 V d.c., independent of the measuring principle.

NOTE 1 IT systems are described in IEC 60364-4-41 amongst other literature. Additional data for a selection of devices in other standards should be noted.

NOTE 2 Further information on insulation fault location can be found in the following standards: IEC 60364-4-41:2005, 411.6, and IEC 60364-5-53:2001, 531.3.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60721-3-1, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 1: Storage*

IEC 60721-3-2, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 2: Transportation*

IEC 60721-3-3, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

IEC 61010-1:2001, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61326-2-4, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-4: Particular requirements – Test configurations, operational conditions*

monitoring devices according to IEC 61557-8 and for
according to IEC 61557-9

IEC 61557-1:2007, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 1: General requirements*

IEC 61557-8:2007, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61557-1, in IEC 61557-8 and the following apply.

3.1

insulation fault location system

device or combination of devices used for insulation fault location in IT systems. The insulation fault location system is used in addition to an insulation monitoring device. It injects a locating current between the electrical system and earth and locates insulation faults

NOTE The requirements for insulation monitoring devices are defined in IEC 61557-8.

3.2

locating current

I_L

r.m.s. value of the current that is injected by the locating current injector during the location process. The locating current can be generated by

- an independent locating voltage source, or
- an independent locating current source, or
- it can be driven directly from the system to be monitored

3.3

locating voltage

U_L

r.m.s. value of the voltage present at the measuring terminals of the locating current injector during the measurement when the device has an independent locating voltage or current source

NOTE In a fault-free, de-energized system, this represents the voltage present between the terminals of the locating device to the system to be monitored and the terminals for the connection to the PE conductor.

3.4

response sensitivity

value of the evaluating current or insulation resistance at which the evaluator responds under specified conditions

NOTE Response sensitivity can either be a fixed threshold or a response curve.

3.5

insulation fault locator

device or part of a device for the location of the insulation fault

3.6

locating current sensor

sensor for the detection of the locating current used for the location of the insulation fault

device or part of a device, which function it is to inject the locating current in the IT system in order to locate the insulation fault

3.8

passive locating current injector

locating current injector that generates the locating current directly from the system to be monitored

3.9

active locating current injector

locating current injector that generates the locating current from a locating voltage source which is independent from the system to be monitored

4 Requirements

The following requirements as well as those given in IEC 61557-1 shall apply.

4.1 Equipment for insulation fault location

Equipment for insulation fault location shall be capable of localizing symmetrical as well as asymmetrical insulation faults in an IT system and to give a warning, if the insulation resistance in a part of the installation falls below the response sensitivity.

If equipment for insulation fault location has a self-test function, the self-test shall not produce an insulation fault to earth.

NOTE 1 See also IEC 61557-8:2007, 4.1.

NOTE 2 Insulation monitoring devices may be deactivated during the location process.

NOTE 3 Warning indication can be done by a lamp, a buzzer or by any other kind of indication.

NOTE 4 Insulation fault locating systems may have a self-test function. Checking the response sensitivity is not necessary.

NOTE 5 Insulation fault location systems with an active locating current source may also be used for insulation fault location in de-energized systems.

4.2 Response sensitivity

Insulation fault location systems shall be designed in such a manner that the response sensitivity stated by the manufacturer will be met under the specified system conditions, at a total symmetrical system leakage capacitance of 1 μF upstream the evaluating current sensor ($C_{Lu} = 1 \mu\text{F}$, $C_{Ld} = 0 \mu\text{F}$ according to Figure C.2).

Information on the influence of the system leakage capacitances higher than 1 μF on the response sensitivity as well as possible interference from the distribution system on the insulation fault location process shall be stated by the manufacturer.

NOTE The total leakage capacitance is the sum of the leakage capacitances of all phase conductors, including the neutral conductor to PE.

4.3 Warning device

Insulation fault location systems shall contain a visual warning device, which indicates if an insulation fault is detected or allow connection to such a device for the indication of a fault. If externally connectable audible signalling devices are provided, they may be fitted with a

During a fault or resetting the device, the audible signal

4.4 Locating current I_L

The maximum locating current I_L shall be limited to 500 mA, r.m.s., to ensure that the locating current does not produce touch voltages above the conventional voltage limit (50 V a.c., 120 V d.c.) under the first fault in the distribution system. The locating current shall not increase above 500 mA, r.m.s., under foreseeable component failures in the locating current injector. When the locating current is adjustable, unintentional changes of the setting shall be prevented by suitable means.

4.5 Locating voltage U_L

If an active locating voltage or locating current is used, the locating voltage U_L shall be equal or below 50 V a.c. or 120 V d.c. (see IEC 60364-4-41) under no load conditions.

If an active locating voltage U_L above 50 V a.c. or 120 V d.c. is used the locating current shall not exceed 3,5 mA a.c., (r.m.s.) or 10 mA d.c. through a pure resistance of 2 000 Ω .

4.6 Indication of the insulation value

When insulation fault location systems include means for the indication of the insulation value, the uncertainty of the indicated value shall be stated by the manufacturer.

4.7 PE connection

Contrary to IEC 61557-1, the PE connection of insulation fault location systems (locating current injector) is a measuring connection and shall be treated as functional earth connection (FE). If the insulation fault location system has accessible parts which are earthed for protective purposes, these connections shall be treated as protective connections (PE).

4.8 Clearances and creepage distances

Insulation fault location systems shall have minimum clearances and creepage distances in accordance with IEC 60664-1 and IEC 60664-3, or only IEC 61010-1. Clearances and creepage distances shall be selected in accordance with

- overvoltage category III,
- pollution degree 2, and
- pollution degree 1 for circuits inside the housing which are coated according to IEC 60664-3.

NOTE For accessible parts on the outside of the housing, creepage distances of pollution degree 3 are recommended to withstand higher environmental requirements.

Where different voltages are used in one device, clearances and creepage distances shall be designed for the highest voltage.

4.9 Electromagnetic compatibility (EMC)

Insulation fault location systems shall comply with the requirements for electromagnetic compatibility (EMC) in accordance with IEC 61326-2-4.

4.10 Additional requirements

Additional requirements for insulation fault location systems are listed in Table 1.

Insulation Fault Location Systems (IFL)

	Requirements for type test	Requirements for routine tests
Response sensitivity	According to 6.1.1	According to 6.2.2
Locating current I_L	According to 6.1.2	Not applicable
Locating voltage U_L	According to 6.1.3	Not applicable
Warning device	According to 6.1.4	According to 6.2.3
Relative uncertainty of the indicated insulation value ^a	According to 6.1.5	Not applicable
Locating current injector	According to 6.1.6	According to 6.2.4
Dielectric test	According to 6.1.7	According to 6.2.5
Electromagnetic compatibility	According to 6.1.8	Not applicable
Marking and operating instructions	According to 6.1.11	According to 6.2.6
Minimum permanently admissible nominal voltage	$1,15 \times U_n$ of the highest nominal voltage U_n ^b	Not applicable
Climatic environmental conditions	<ul style="list-style-type: none"> Operation: class 3k5 (IEC 60721-3-3: -5 °C to +45 °C) ^c Transport: class 2k3 (IEC 60721-3-2: -25 °C to +70 °C) Storage: class 1k4 (IEC 60721-3-1: -25 °C to +55 °C) 	
<p>^a The relative uncertainty is evaluated under the conditions of 4.5 and in addition:</p> <ul style="list-style-type: none"> operation temperatures between -5 °C and +45 °C; at the voltages U_s and U_n and the leakage capacitances C_e stated by the manufacturer in the operating instructions. <p>^b U_n is the phase-to-phase voltage in a three-phase system or the phase-to-neutral voltage in a one-phase system.</p> <p>^c Except condensation and the formation of ice.</p>		

5 Marking and operating instructions

5.1 Marking

In addition to the marking in accordance with IEC 61557-1, the following information shall be provided on insulation fault location systems, if applicable.

5.1.1 Type of device as well as mark of origin or name of the manufacturer.

5.1.2 Type of IT system to be monitored (if the insulation fault location system is designed for a specific type of IT system).

5.1.3 Wiring diagram or number of the wiring diagram or number of the operating instructions.

5.1.4 Nominal system voltage U_n or range of the nominal voltage.

5.1.5 Nominal value of the rated supply voltage U_s or range of the rated supply voltage.

5.1.6 Nominal frequency of the rated supply voltage U_s and the nominal voltage U_n or working range of frequencies for the rated supply voltage or nominal voltage.

of response sensitivity under specified conditions

5.1.8 The serial number, the year of manufacture or the type designation mandatory on the outside and, if necessary, on the inside.

5.1.9 All data of 5.1 shall be indelibly marked on the insulation fault location system.

5.2 Operating instructions

The operating instructions shall state the following in addition to the statements given in IEC 61557-1.

5.2.1 Maximum value of the locating voltage U_L in case when it is independent from the voltage in the system to be monitored.

5.2.2 Maximum value of the locating current I_L in cases where it is independent from the voltage in the system to be monitored.

5.2.3 Response sensitivity.

5.2.4 Technical data of the interface for the connection of an external warning device, including rated voltage and rated current, rated insulation voltage and explanation of the interface function.

NOTE The information for contact circuits should be in accordance with IEC 61810-2 or IEC 60947-5-1 and IEC 60947-5-4.

5.2.5 Wiring diagram when this is not marked on the device in accordance with 5.1.3.

5.2.6 Information on the influence of system leakage capacitances, of the system voltage and of the type of distribution system on the response sensitivity.

5.2.7 Locating voltage according to 6.1.7 and conformity to the relevant EMC standards.

5.2.8 Functional description of the insulation fault location system.

5.2.9 An indication that the system to be monitored including any connected appliances might be influenced by insulation fault location systems, for example influence on residual current devices (RCDs).

5.2.10 An indication that insulation monitoring devices may be influenced by insulation fault location systems, if applicable.

5.2.11 If the insulation monitoring device is deactivated during the fault indication, it shall be explained in the operating instructions.

5.2.12 The maximum operating uncertainty for the response sensitivity under specified conditions.

5.2.13 The maximum operating uncertainty for the indication of the insulation value, if applicable.

The following tests in addition to those required according to IEC 61557-1 shall be executed (see also Table 1).

6.1 Type test

The type tests shall be carried out according to 6.1.1 to 6.1.12.

6.1.1 Response sensitivity of the insulation fault location system

The response sensitivity shall be tested at the lowest and at the highest value of the nominal system voltage U_n and of the rated supply voltage U_s and under the conditions of 4.2.

For this test, the insulation resistance shall be simulated as follows:

- single pole (from one phase of U_n);
- symmetrically (same resistor from all phases of U_n).

The measuring device used for testing shall be able to accommodate slow continuous or fine-step changes of the insulation resistance as well as a connection of system leakage capacitances according to 4.2. Capacitors with an insulation resistance of at least 100 M Ω and a tolerance limit of ± 10 % maximum shall be used for simulating system leakage capacitances.

During testing, the insulation faults are simulated by externally connected test resistors. The response sensitivity shall be determined at the lower and the upper value of the voltage of the system to be monitored by reducing the test resistances slowly. The response sensitivity shall be determined with symmetrical and single pole test resistances. If the measuring principle depends on the magnitude of the system leakage capacitance, the specified response sensitivity shall be tested by connecting capacitors step by step.

When the insulation fault location system is provided with adjustable response sensitivity, the tests shall be performed at the lowest and at the highest value for a value which is adjustable continuously and for all values with fixed selectable response sensitivities.

The tests shall be performed under the climatic environmental conditions of Table 1.

The response sensitivity shall be compared with the values stated by the manufacturer.

6.1.2 Locating current I_L

Compliance with the requirements in 4.4 and 4.5 shall be verified.

The locating current shall be measured in an IT system with no leakage capacitance and with an insulation resistance >100 M Ω as follows:

- If the location current is driven directly from the system to be monitored or if an independent locating voltage source is used with a locating voltage equal or below 50 V a.c or 120 V d.c:
 - set the voltage of the IT system to the maximum nominal system voltage of the device;
 - connect an Ampere Meter (mA meter) between one phase conductor and the PE conductor and measure the r.m.s value of the locating current. The measured value shall not be higher than the value stated by the manufacturer in the operating instructions and shall not be higher than 500 mA.
- If an independent locating voltage source is used with a locating voltage above 50 V a.c. or 120 V d.c.:

series with an Ampere Meter (mA meter) between the
and the earth terminal and measure the r.m.s. current of
the locating current. The measured value shall not be higher than 3,5 mA a.c. (r.m.s.) or
10 mA d.c.

6.1.3 Locating voltage U_L

Compliance with 4.5 shall be verified, if applicable. The locating voltage is measured using a voltmeter, which is connected between the connections of the locating current injector to the system to be monitored and the PE conductor under no load condition.

6.1.4 Warning device

Compliance with the requirements given in 4.3 shall be verified.

6.1.5 Equipment for indication of the insulation value

Compliance with 4.6 shall be verified.

6.1.6 Locating current injector

Compliance with 4.4 shall be verified.

6.1.7 Dielectric test

Insulation fault detection systems shall be tested in accordance with IEC 61010-1.

6.1.8 Electromagnetic compatibility (EMC)

The electromagnetic compatibility shall be tested in accordance with IEC 61326-2-4.

6.1.9 Loss of locating current sensor connection

If provided, it shall be verified that loss of the connection to the locating current sensor is indicated according to 4.1.

For this test, interruption and short circuit of the connection shall be simulated.

6.1.10 Additional requirements

Compliance with the requirements given in 4.6, 4.7, 4.8 and 4.10 shall be verified.

6.1.11 Marking and operating instructions

Compliance with the requirements given in 5.1 and 5.2 shall be verified by visual inspection.

6.1.12 Record of the type test

The results of the type test shall be documented.

6.2 Routine tests

6.2.1 General

Routine tests shall be carried out according to Table 1.

NOTE Engineering and statistical analyses may show that routine tests on each insulation fault location system may not always be required, in which case sampling tests may be made instead. These tests should be carried out either during the manufacturing process or at the end.

The response sensitivity shall be verified for compliance on each insulation fault location system. The routine test shall be carried out in accordance with 6.1.1 and at the specified conditions of 4.2. In this test the following conditions apply:

- room temperature (23 ± 3) °C at 1,0 times U_n and 1,0 times U_S or the lowest and highest rated value of U_n and U_S for a device with several rated voltages or with a range of rated voltages;
- at a minimum of three settings including the minimum, the maximum and at a point in the centre of the setting of the response sensitivity for devices with continuously adjustable response sensitivity;
- at each step for devices with stepwise adjustment of the response sensitivity.

During this test, the limits shall be reduced to such a degree that the conditions in Table 1 are met.

6.2.3 Warning device

Compliance with the requirements given in 4.3 shall be verified.

6.2.4 Self-test function

Compliance with 4.1 shall be verified.

6.2.5 Dielectric test

The dielectric test shall be performed in accordance with Annex F of IEC 61010-1:2001.

6.2.6 Marking and operating instructions

Compliance with 5.1 shall be verified by visual inspection.

Annex A
(normative)

Equipment for insulation fault location in medical locations

A.1 Scope and object

This Annex A specifies the additional requirements for equipment for insulation fault location which is used in unearthed IT a.c. systems of GROUP 2 medical locations in accordance with IEC 60364-7-710.

NOTE The information and requirements specified here replace or supplement the corresponding clauses and subclauses of the main text of this standard, as indicated.

A.2 Normative references

The following referenced documents are indispensable for the application of Annex A. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CISPR 11, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*

IEC 60364-7-710:2002, *Electrical installations of buildings – Part 7-710: Requirements for special installations or locations – Medical locations*

A.3 Terms and definitions

For the purposes of this Annex, the terms and definitions given in Clause 3 of this standard, as well as the following apply.

A.3.1
equipment for insulation fault location in medical locations

specific insulation fault location equipment dedicated to locating insulation faults in IT systems of GROUP 2 medical location. These devices should comply with Annex A

A.3.2
response time

t_{al}

time required by insulation fault location equipment to respond under the conditions of A.4.5

A.3.3
GROUP 2 medical locations

medical locations, where applied parts are intended to be used in applications such as intracardiac procedures, operating theatres and vital treatment, where discontinuity (failure) of the supply can cause danger to life

NOTE An intracardiac procedure is a procedure, whereby an electrical conductor is placed within the cardiac zone of a patient or is likely to come into contact with the heart, such conductor being accessible outside the patient's body. In this context, an electrical conductor includes insulated wires, such as cardiac pacing electrodes or intracardiac ECG-electrodes, or insulated tubes filled with conducting fluids.

[IEC 60364-7-710, 710.3.7]

The following requirements or modifications as well as those given in Clause 4 of this standard shall apply.

A.4.1 Response sensitivity

The minimum response sensitivity shall be $50 \text{ k}\Omega$ or $U_n / 50 \text{ k}\Omega$ at a total upstream leakage capacitance (sum of the leakage capacitances of all phase conductors to ground) of $1 \text{ }\mu\text{F}$.

A.4.2 Locating current I_L

The locating current shall be limited to 1 mA r.m.s.

A.4.3 Locating voltage U_L

If an active locating voltage or locating current is used, the locating voltage U_L shall be below $25 \text{ V a.c. r.m.s. or d.c.}$ according to IEC 60364-7-710.

A.4.4 Electromagnetic compatibility (EMC)

Equipment for insulation fault location in medical locations shall comply with IEC 61326-2-4 and in addition with CISPR 11.

A.4.5 Response time t_{al}

The response time under the conditions of A.4.2 shall be stated by the manufacturer.

A.4.6 Indication

An indication shall take place that indicates in which section of the installation the insulation fault has been detected.

A.5 Marking and operating instructions

Clause 5 of this standard applies.

A.6 Tests

Clause 6 of this standard applies. Additionally the requirements of A.4 shall be considered.

A.6.1 Type tests

The response time t_{al} shall be tested at the nominal system voltage and at a total leakage capacitance of $1 \text{ }\mu\text{F}$ symmetrically distributed from all phase conductors upstream the evaluating current sensor by suddenly reducing the insulation resistance from nearly infinity to $25 \text{ k}\Omega$. Table A.1 shows additional requirements applicable to equipment for insulation fault location in medical locations. Table A.2 shows emission test for equipment for insulation fault location in medical locations.

**Requirements applicable to equipment
for insulation fault location in medical locations**

	Requirements for type tests	Requirements for routine tests
Response sensitivity	According to 6.1.1 and A.4.1	According to 6.2.2 and A.4.1
Locating current I_L	According to 6.1.2 and A.4.2	Not applicable
Locating voltage U_L	According to 6.1.3 and A.4.3	Not applicable
Electromagnetic compatibility	According to 6.1.8 and A.4.4 (Table A.2)	Not applicable

**Table A.2 – Emission test for equipment for insulation
fault location in medical locations**

Test No.	Access	Test	Specification	Class	Comment	Basic Standard
1	Complete device	Radiated disturbance emission	30 MHz to 230 MHz 230 MHz to 1 000 MHz	B	At rated voltage	CISPR 11
2	Supply connections and main connections	Conducted disturbance emission	150 kHz to 30 MHz	B	At rated voltage	CISPR 11

Annex B (normative)

Portable equipment for insulation fault location

B.1 Scope and object

This Annex B specifies the additional requirements for portable equipment for insulation fault location which is used in unearthed IT systems.

This portable equipment can be used instead or in combination with fixed equipment for insulation fault location.

NOTE The information and requirements specified here replace or supplement the corresponding clauses and subclauses of the main text of this standard, as indicated.

B.2 Normative references

The following referenced documents are indispensable for the application of this Annex. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61010-031, *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 031: Safety requirements for hand-held probe assemblies for measurement and test*

IEC 61010-2-032, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-032: Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement*

B.3 Terms and definitions

For the purposes of this Annex, the terms and definitions given in Clause 3 of this standard, as well as the following apply.

B.3.1

portable equipment for insulation fault location

equipment used for temporary insulation fault location in IT systems instead of, or additionally, to fixed installed insulation fault location equipment. These devices should comply with Annex B

B.4 Requirements

The following requirements or modifications as well as those given in Clause 4 of this standard shall apply.

B.4.1 Portable locating current sensors

If portable locating current sensors are used as evaluating current sensors, they shall comply with IEC 61010-2-032.

The portable locating current sensors shall be current sensors type A according to IEC 61010-2-032.

If hand-held probe assemblies or assemblies for the connection of the portable devices to the system to be monitored are used, they shall comply with IEC 61010-031.

The probe assemblies shall be type A according to IEC 61010-031.

B.5 Operating instructions

Clause 5 of this standard applies, as well as the additional subclauses.

B.5.1 Information on the influence of electromagnetic fields in the vicinity of the locating current sensor shall be included in the operating instructions.

B.5.2 Information on the influence of the load current in the current carrying parts of the system to which the locating current sensor shall be applied shall be included in the operating instructions.

NOTE Information should be added that in the case the locating current sensor for example is erroneously applied to one single d.c. load current carrying conductor. It is possible, that the locating current sensor may only be removed after switching off the load current in the system.

B.6 Tests

Clause 6 of this standard applies except 6.1.9.

B.6.1 Type tests

Clause 6 of this standard applies. In addition, the requirements of B.4 and B.5 shall be considered.

Annex C
(informative)

Example of an insulation fault location system and explanation of upstream / downstream leakage capacitances

Figure C.1 shows an example of an insulation fault location system.

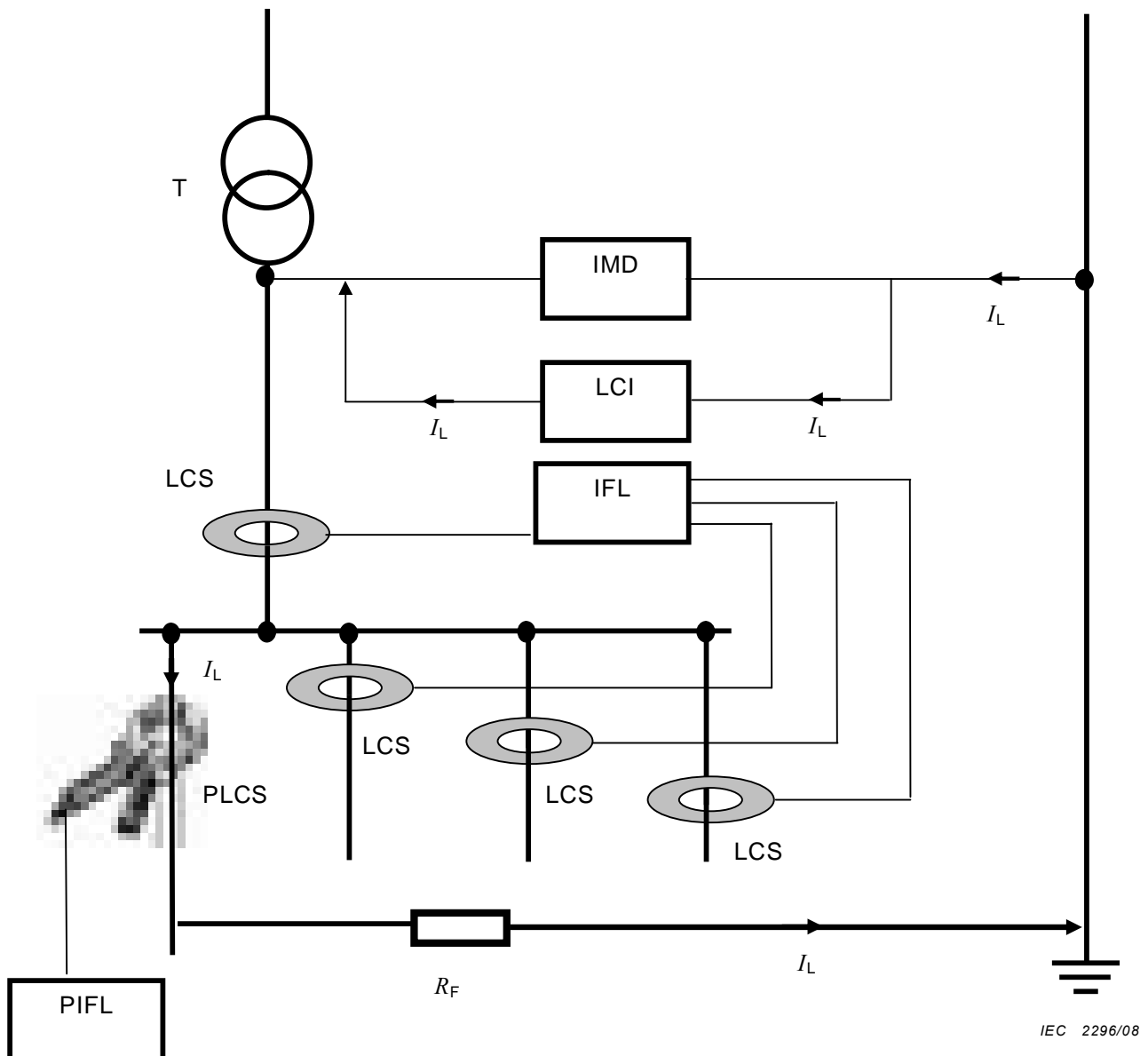


Figure C.1 – Example of an insulation fault location system

IMD	insulation monitoring device
LCI	locating current injector
IFL	insulation fault locator
LCS	locating current sensor
PIFL	portable insulation fault locator
PLCS	portable locating current sensor
T	IT system transformer
I_L	locating current
R_F	insulation resistance

NOTE 1 An insulation fault location system usually consists of several functions (see Figure C.1):

- insulation monitoring device according to IEC 61557-8;
- locating current injector, portable or permanently installed;
- locating current sensor (e.g. current transformer or current clamp): these are used for the detection of the locating current and are connected to the insulation fault locator;
- insulation fault locator, portable or permanently installed: the locating current sensors are connected to the insulation fault evaluator to detect the locating current.

These functions may be performed either by a single device for each function; or all functions may be integrated into one device; or some or all functions may be integrated into an insulation monitoring device according to IEC 61557-8; or into combined devices which fulfil additional monitoring functions.

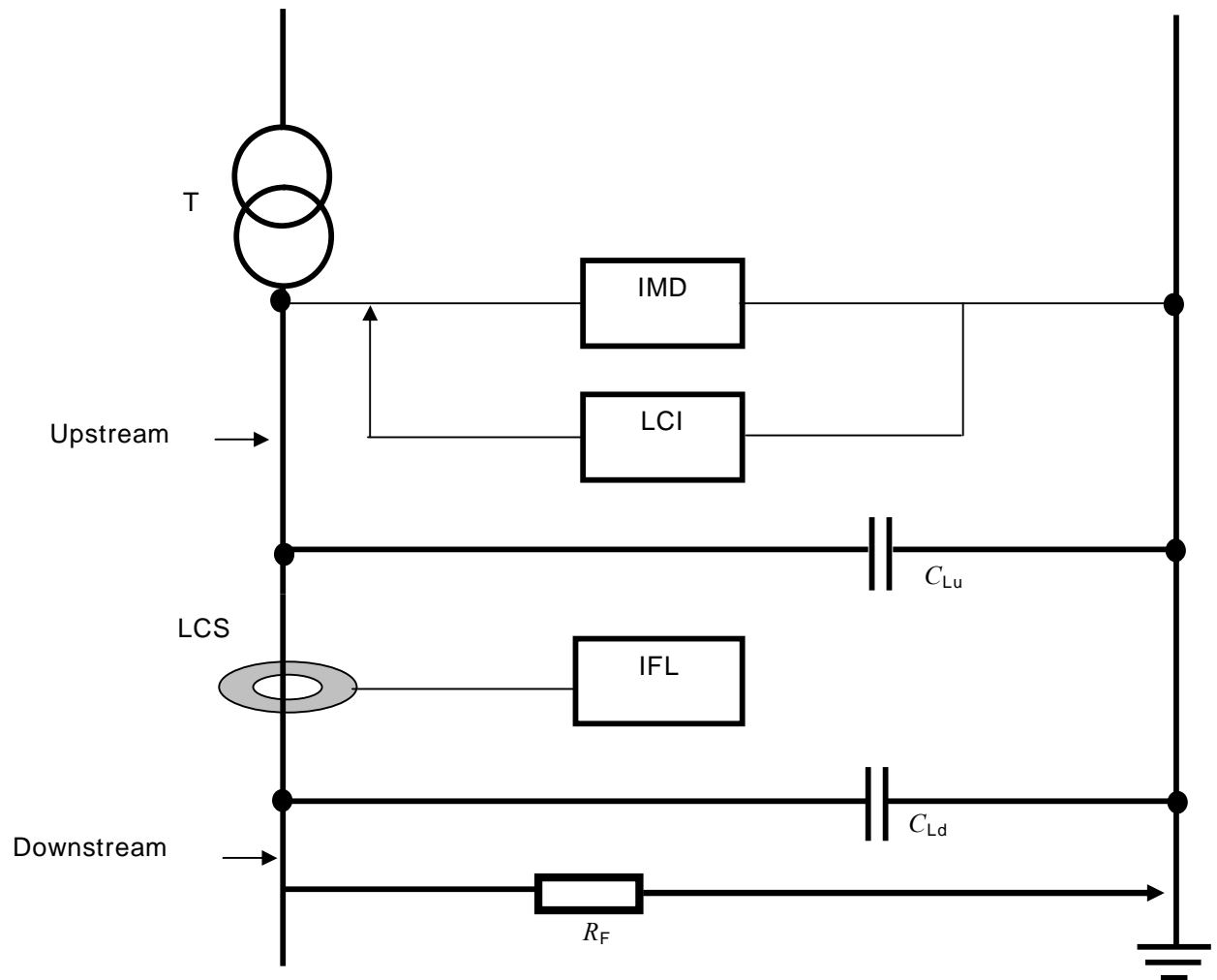
The locating current injector may be a passive device or an active device. In case of a passive device, the locating current is driven by the voltage to ground of the system to be monitored and is limited by the locating current injector to the maximum locating current. In an active test device, the locating current is generated by an independent active voltage or current source inside the test device.

NOTE 2 IMD, LCI and IFL may either be single devices, or all or some of these functions may be combined into one single device.

NOTE 3 PIFL may be used together with a fixed installed locating current injector or a portable locating current injector may be used.

Figure C.1 – Example of an insulation fault location system (continued)

stream/downstream leakage capacitance.



IEC 2297/08

Key

IMD	insulation monitoring device
LCI	locating current injector
IFL	insulation fault locator
LCS	locating current sensor
T	IT system transformer
C_{Lu}	leakage capacitance upstream of the evaluating current sensor
C_{Ld}	leakage capacitance downstream of the evaluating current sensor
R_F	insulation resistance

Figure C.2 – Explanation of upstream/downstream leakage capacitance



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