

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

## COMMENTED VERSION

---

### **Elsäkerhet i elinstallationer för lågspänning – Utrustning för provning, mätning och övervakning av skyddsåtgärder – Del 9: Lokalisering av isolationsfel i IT-system**

*Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC –  
Equipment for testing, measuring or monitoring of protective measures –  
Part 9: Equipment for insulation fault location in IT systems*

En så kallad ”Commented Version” (CMV) innehåller både den fastställda IEC-standarden och en kommenterad och ändringsmarkerad standard. Alla tillägg och borttagningar sedan den tidigare utgåvan är markerade med färg. Med en CMV sparar du mycket tid när du ska identifiera och förklara aktuella ändringar i standarden. SEK Svensk Elstandard kan bara ge ut CMV i de fall den finns tillgänglig från IEC.



IEC 61557-9

Edition 4.0 2023-12  
COMMENTED VERSION

# INTERNATIONAL STANDARD



---

**Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 9: Equipment for insulation fault location in IT systems**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 25.040.40

ISBN 978-2-8322-8055-3

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD .....	5
1 Scope .....	7
2 Normative references .....	7
3 Terms, definitions and abbreviated terms .....	9
3.1 Terms, definitions, symbols and units .....	9
3.2 Abbreviated terms and symbols .....	12
4 Requirements .....	13
4.1 General requirements .....	13
4.2 <del>Mandatory</del> Functions provided by an IFLS .....	14
4.2.1 Location warning .....	14
4.2.2 Local location warning (LLW) .....	14
4.2.3 Remote location warning (RLW) .....	14
4.3 Optional functions provided by IFLS .....	15
4.3.1 Indication of the insulation value .....	15
4.3.2 <del>Performance of the IFLS</del> Alarm in case of the interruption of the loss of the connection to the locating current sensor (LCS) .....	15
4.3.3 Self-test .....	15
4.4 Performance requirements .....	15
4.4.1 Response sensitivity .....	15
<del>4.4.2 Locating current <math>I_L</math></del> .....	
<del>4.4.3 Locating voltage <math>U_L</math></del> .....	
4.4.2 Locating current $I_L$ and locating voltage $U_L$ .....	16
4.4.3 Permanently admissible nominal voltage $U_{pa}$ .....	16
4.4.4 Supply voltage $U_S$ .....	16
4.5 Safety requirements .....	17
<del>4.5.1 General</del> .....	
4.5.1 Clearance and creepage distances .....	17
4.5.2 Protection class and earth connection of the IFLS .....	17
4.6 Electromagnetic compatibility .....	17
4.7 Mechanical requirements .....	18
<del>4.7.1 General</del> .....	
4.7.1 Product mechanical robustness .....	18
4.7.2 IP protection class requirements .....	19
4.8 Climatic environmental conditions .....	19
5 Marking and operating instructions .....	19
5.1 Marking .....	19
5.2 Operating instructions .....	19
6 Tests .....	20
6.1 General .....	20
6.2 Type tests .....	21
<del>6.2.1 General</del> .....	
6.2.1 Climatic tests .....	21
6.2.2 Test of response sensitivity of the IFLS .....	21
6.2.3 Test of the locating current $I_L$ and locating voltage $U_L$ .....	22
<del>6.2.4 Test of the locating voltage <math>U_L</math></del> .....	

6.2.4	Test of the location warning .....	28
6.2.5	Test of the indication of the insulation value .....	28
6.2.6	Verification of insulation coordination .....	28
<del>6.2.7</del>	<del>Test of the performance of the LCI .....</del>	<del>28</del>
<del>6.2.8</del>	<del>Voltage test .....</del>	<del>28</del>
6.2.7	Test of the electromagnetic compatibility (EMC) .....	28
6.2.8	Test of the loss of LCS connection .....	28
6.2.9	Test of the protection class and of the earth connection of the IFLS .....	28
6.2.10	Inspection of the marking and operating instructions .....	28
6.2.11	Mechanical test .....	29
6.2.12	Record of the type test .....	29
6.3	Routine tests .....	29
6.3.1	General .....	29
<del>6.3.2</del>	<del>Test of the response sensitivity .....</del>	<del>29</del>
<del>6.3.3</del>	<del>Test of the location warning .....</del>	<del>29</del>
<del>6.3.4</del>	<del>Test of the self-test function .....</del>	<del>29</del>
6.3.2	Voltage test .....	30
<del>6.3.6</del>	<del>Compliance with the tests of Clause 6 .....</del>	<del>30</del>
6.3.3	Recording of routine tests .....	30
7	Overview of requirements and tests for IFLS .....	30
Annex A (normative) <del>Equipment for</del> Insulation fault location system in medical locations (MED-IFLS) .....		32
A.1	<del>Scope</del> General .....	32
A.2	Requirements .....	32
A.2.1	General .....	32
A.2.2	Performance requirements .....	32
A.2.3	Electromagnetic compatibility .....	33
<del>A.3</del>	<del>Marking and operating instructions .....</del>	<del>33</del>
<del>A.4</del>	<del>Tests .....</del>	<del>33</del>
A.3	Additional tests .....	34
A.3.1	General .....	34
A.3.2	Test of the performance requirements .....	34
A.3.3	Test of the response time .....	34
A.3.4	Test of the electromagnetic compatibility (EMC) .....	34
Annex B (normative) Portable equipment for insulation fault location .....		36
B.1	<del>Scope</del> General .....	36
B.2	Additional requirements .....	36
B.2.1	General .....	36
B.2.2	Performance requirements .....	36
B.3	Marking and operating instructions .....	36
B.4	Additional tests .....	36
Annex C (informative) Example of an IFLS and explanation of upstream and downstream system leakage capacitances .....		38
C.1	Examples for the functions of an IFLS .....	38
C.2	Upstream and downstream system leakage capacitance .....	40
Bibliography .....		41
List of comments .....		42

Figure 1 – Test configuration: $I_L$ driven directly from the system to be monitored .....	25
<del>Figure 2 – Test configuration: Independent locating voltage source with a locating voltage equal or below 50 V a.c. or 120 V d.c. ....</del>	<del>26</del>
Figure 2 – Test configuration: Active locating source .....	26
<del>Figure 3 – Test configuration: Independent voltage source is used with a locating voltage above 50 V a.c. or 120 V d.c. ....</del>	<del>27</del>
Figure 3 – Test configuration for current testing: Active locating source is used with a locating voltage above 50 V AC RMS and 70 V peak or 120 V DC .....	27
Figure C.1 – Example of an IFLS .....	39
Figure C.2 – Explanation of upstream and downstream system leakage capacitance .....	40
Table 1 – Abbreviated terms and symbols .....	12
<del>Table 2 – Product mechanical requirements .....</del>	<del>19</del>
Table 2 – Minimum IP requirements for IFLS .....	19
Table 3 – Reference conditions for testing .....	21
Table 4 – <del>Reference conditions for tests in operation</del> Climatic tests in operation .....	21
Table 5 – <del>Reference conditions for storage tests</del> Climatic tests for storage .....	21
Table 6 – List of test conditions (TC) .....	22
Table 7 – Product mechanical test .....	29
Table 8 – Requirements and tests on IFLSs .....	31
<del>Table A.1 – Additional requirements applicable to equipment for insulation fault location in medical locations .....</del>	<del>35</del>
<del>Table A.2 – Emission test for equipment for insulation fault location in medical locations .....</del>	<del>35</del>
Table A.1 – Additional requirements applicable to MED-IFLS .....	35
Table A.2 – Emission test for MED-IFLS .....	35

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP TO 1 000 V AC AND 1 500 V DC – EQUIPMENT FOR TESTING, MEASURING OR MONITORING OF PROTECTIVE MEASURES –****Part 9: Equipment for insulation fault location in IT systems**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

**This commented version (CMV) of the official standard IEC 61557-9:2023 edition 4.0 allows the user to identify the changes made to the previous IEC 61557-9:2014 edition 3.0. Furthermore, comments from IEC TC 85 experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.**

**A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.**

**This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.**

IEC 61557-9 has been prepared by IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) new terms and definitions on maximum admissible locating AC and DC currents and voltages;
- b) the requirements on locating current and locating voltage have been revised;
- c) performance requirements have been added;
- d) the test requirements for locating current and locating voltage have been revised;
- e) the structure of this document has been adapted to that of IEC 61557-1:2019;
- f) the limit values under Clause A.2 were adapted to fit the changed test methods in 6.2.3.

The text of this International Standard is based on the following documents:

Draft	Report on voting
85/896/FDIS	85/901/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

A list of all parts in the IEC 61557 series, published under the general title *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP TO 1 000 V AC AND 1 500 V DC – 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 the insulation fault location system (IFLS) that localizes insulation faults in any part of the system in unearthed IT AC systems and unearthed IT AC systems with galvanically connected DC circuits having nominal voltages up to 1 000 V AC, as well as in unearthed IT DC systems with voltages up to 1 500 V DC, 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.~~ **1** Further information on insulation fault location can be found in the following International standards: IEC 60364-4-41:2005, 411.6 and IEC 60364-4-41:2005/AMD1:2017, 411.6, and IEC 60364-5-53:2004/2019/AMD1:2020, **2** 531.3.

NOTE 2 This document covers both passive IFLS and active IFLS. Active IFLS can be used in de-energised systems. **3**

NOTE 3 This document does not cover IMD complying with IEC 61557-8. **4**

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60364-7-710:2002/2021, *Low-voltage electrical installations ~~of buildings~~ – Part 7-710: Requirements for special installations or locations – Medical locations*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

~~IEC 60664 (all parts): Insulation coordination for equipment within low-voltage systems~~

IEC 60721-3-1:2018, *Classification of environmental conditions – Part 3-1: Classification of groups of environmental parameters and their severities – Storage*

IEC 60721-3-2:2018, *Classification of environmental conditions – Part 3-2: Classification of groups of environmental parameters and their severities – Transportation and handling*

IEC 60721-3-3:2019, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 60947-5-4:2002, *Low-voltage switchgear and controlgear – Part 5-4: Control circuit devices and switching elements – Method of assessing the performance of low-energy contacts – Special tests*

IEC 60947-5-4:2002/AMD1:2019

IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61010-1:2010/AMD1:2016

IEC 61010-2-030, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Particular requirements for equipment having testing ~~and~~ measuring circuits*

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

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61326-1:2020, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

IEC 61326-2-2, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-2: Particular requirements – Test configurations, operational conditions and performance criteria for portable testing, measuring and monitoring equipment used in low-voltage distribution systems*

IEC 61326-2-4, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-4: Particular requirements – Test configurations, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8 and for equipment for insulation fault location according to IEC 61557-9*

IEC 61557-1:~~2007~~2019, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 1: General requirements*

IEC 61557-8:2014, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems*

IEC 61810-2:2017, *Electromechanical elementary relays – Part 2: Reliability*

~~CISPR 11, Industrial, scientific and medical equipment – Radio frequency disturbance characteristics – Limits and methods of measurement~~

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

## Elsäkerhet i elinstallationer för lågspänning – Utrustning för provning, mätning och övervakning av skyddsåtgärder – Del 9: Lokalisering av isolationsfel i IT-system

*Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC –  
Equipment for testing, measuring or monitoring of protective measures –  
Part 9: Equipment for insulation fault location in IT systems*

Som svensk standard gäller europastandarden EN IEC 61557-9:2025. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 61557-9:2025.

### Nationellt förord

Europastandarden EN IEC 61557-9:2025

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 61557-9, Fourth edition, 2023 - Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 9: Equipment for insulation fault location in IT systems**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 61557-9, utg 3:2015 med eventuella tillägg, ändringar och rättelser gäller ej fr o m 2028-04-30.

## Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

## SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

## Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

## Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

## SEK Svensk Elstandard

Box 1042  
172 21 Sundbyberg  
Tel 08-444 14 00  
elstandard.se

EUROPEAN STANDARD

EN IEC 61557-9

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2025

ICS 25.040.40

Supersedes EN 61557-9:2015; EN 61557-9:2015/AC:2016-06; EN 61557-9:2015/AC:2017-02

English Version

Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC - Equipment for testing, measuring or monitoring of protective measures - Part 9: Equipment for insulation fault location in IT systems  
(IEC 61557-9:2023)

Sécurité électrique dans les réseaux de distribution basse tension au plus égale à 1 000 V en C.A et 1 500 V en C.C - Dispositifs de contrôle, de mesure ou de surveillance de mesures de protection - Partie 9: Dispositifs de localisation de défauts d'isolement pour réseaux IT  
(IEC 61557-9:2023)

Elektrische Sicherheit in Niederspannungsnetzen bis AC 1 000 V und DC 1 500 V - Geräte zum Prüfen, Messen oder Überwachen von Schutzmaßnahmen - Teil 9: Einrichtungen zur Isolationsfehlersuche in IT-Systemen  
(IEC 61557-9:2023)

This European Standard was approved by CENELEC on 2024-10-16. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2025 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

Ref. No. EN IEC 61557-9:2025 E

SEK Svensk Elstandard

SS-EN IEC 61557-9, utg 4:2025

## **European foreword**

The text of document 85/896/FDIS, future edition 4 of IEC 61557-9, prepared by TC 85 "Measuring equipment for electrical and electromagnetic quantities" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61557-9:2025.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2026-04-30
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2028-04-30

This document supersedes EN 61557-9:2015 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

### **Endorsement notice**

The text of the International Standard IEC 61557-9:2023 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60364-4-41:2005	NOTE	Approved as HD 60364-4-41:2017 +A11:2017
IEC 60664 series	NOTE	Approved as EN 60664 series
IEC 60664-1	NOTE	Approved as EN IEC 60664-1
IEC 60664-3	NOTE	Approved as EN 60664-3
IEC 61557-15	NOTE	Approved as EN 61557-15
IEC 61810-2:2017	NOTE	Approved as EN 61810-2:2017 (not modified)

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cencenelec.eu](http://www.cencenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-1	2007	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	2007
IEC 60068-2-2	2007	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	2007
IEC 60068-2-6	-	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	-
IEC 60068-2-27	2008	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	2009
IEC 60364-7-710	2021	Low-voltage electrical installations - Part 7-710: Requirements for special installations or locations - Medical locations	HD 60364-7-710	2024
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-
IEC 60721-3-1	2018	Classification of environmental conditions - Part 3-1: Classification of groups of environmental parameters and their severities - Storage	EN IEC 60721-3-1	2018
IEC 60721-3-2	2018	Classification of environmental conditions - Part 3-2: Classification of groups of environmental parameters and their severities - Transportation and Handling	EN IEC 60721-3-2	2018
IEC 60721-3-3	2019	Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weatherprotected locations	EN IEC 60721-3-3	2019
IEC 60947-5-1	2016	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices	EN 60947-5-1	2017

## EN IEC 61557-9:2025 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60947-5-4	2002	Low-voltage switchgear and controlgear - Part 5-4: Control circuit devices and switching elements - Method of assessing the performance of low-energy contacts - Special tests	EN 60947-5-4	2003
+ A1	2019		+ A1	2019
IEC 61010-1	2010	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	EN 61010-1	2010
+ A1 (mod)	2016		+ A1	2019
IEC 61010-2-030	-	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for equipment having testing or measuring circuits	EN IEC 61010-2-030	-
IEC 61010-031	-	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 031: Safety requirements for hand-held and hand-manipulated probe assemblies for electrical test and measurement	EN IEC 61010-031	-
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	EN IEC 61010-2-032	-
IEC 61140	-	Protection against electric shock - Common aspects for installation and equipment	EN 61140	-
IEC 61326-1	2020	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements	EN IEC 61326-1	2021
IEC 61326-2-2	-	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2: Particular requirements - Test configurations, operational conditions and performance criteria for portable testing, measuring and monitoring equipment used in low-voltage distribution systems	EN IEC 61326-2-2	-
IEC 61326-2-4	-	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-4: Particular requirements - Test configurations, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8 and for equipment for insulation fault location according to IEC 61557-9	EN IEC 61326-2-4	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61557-1	2019	Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC - Equipment for testing, measuring or monitoring of protective measures - Part 1: General requirements	EN IEC 61557-1	2021
IEC 61557-8	2014	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	EN 61557-8	2015
IEC 61810-2	2017	Electromechanical elementary relays - Part 2: Reliability	EN 61810-2	2017

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

---

**Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures –**

**Part 9: Equipment for insulation fault location in IT systems**

**Sécurité électrique dans les réseaux de distribution basse tension au plus égale à 1 000 V C.A et 1 500 V C.C – Dispositifs de contrôle, de mesure ou de surveillance de mesures de protection –**

**Partie 9: Dispositifs de localisation de défauts d'isolement pour réseaux IT**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 25.040.40

ISBN 978-2-8322-7836-9

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references .....	7
3 Terms, definitions and abbreviated terms .....	9
3.1 Terms, definitions, symbols and units .....	9
3.2 Abbreviated terms and symbols .....	12
4 Requirements .....	13
4.1 General requirements .....	13
4.2 Functions provided by an IFLS.....	14
4.2.1 Location warning .....	14
4.2.2 Local location warning (LLW).....	14
4.2.3 Remote location warning (RLW).....	14
4.3 Optional functions provided by IFLS.....	14
4.3.1 Indication of the insulation value.....	14
4.3.2 Alarm in case of the interruption of the loss of the connection to the locating current sensor (LCS) .....	14
4.3.3 Self-test.....	14
4.4 Performance requirements.....	15
4.4.1 Response sensitivity .....	15
4.4.2 Locating current $I_L$ and locating voltage $U_L$ .....	15
4.4.3 Permanently admissible nominal voltage $U_{pa}$ .....	15
4.4.4 Supply voltage $U_S$ .....	16
4.5 Safety requirements.....	16
4.5.1 Clearance and creepage distances .....	16
4.5.2 Protection class and earth connection of the IFLS .....	16
4.6 Electromagnetic compatibility.....	16
4.7 Mechanical requirements .....	16
4.7.1 Product mechanical robustness .....	16
4.7.2 IP protection class requirements.....	16
4.8 Climatic environmental conditions .....	17
5 Marking and operating instructions .....	17
5.1 Marking.....	17
5.2 Operating instructions .....	17
6 Tests .....	18
6.1 General.....	18
6.2 Type tests .....	18
6.2.1 Climatic tests .....	18
6.2.2 Test of response sensitivity of the IFLS .....	19
6.2.3 Test of the locating current $I_L$ and locating voltage $U_L$ .....	20
6.2.4 Test of the location warning.....	23
6.2.5 Test of the indication of the insulation value .....	23
6.2.6 Verification of insulation coordination .....	23
6.2.7 Test of the electromagnetic compatibility (EMC) .....	23
6.2.8 Test of the loss of LCS connection .....	23
6.2.9 Test of the protection class and of the earth connection of the IFLS .....	23
6.2.10 Inspection of the marking and operating instructions.....	23

6.2.11	Mechanical test .....	23
6.2.12	Record of the type test .....	24
6.3	Routine tests .....	24
6.3.1	General .....	24
6.3.2	Voltage test .....	24
6.3.3	Recording of routine tests .....	24
7	Overview of requirements and tests for IFLS .....	25
Annex A (normative)	Insulation fault location system in medical locations (MED-IFLS) .....	26
A.1	General .....	26
A.2	Requirements .....	26
A.2.1	General .....	26
A.2.2	Performance requirements .....	26
A.2.3	Electromagnetic compatibility .....	26
A.3	Additional tests .....	27
A.3.1	General .....	27
A.3.2	Test of the performance requirements .....	27
A.3.3	Test of the response time .....	27
A.3.4	Test of the electromagnetic compatibility (EMC) .....	27
Annex B (normative)	Portable equipment for insulation fault location .....	29
B.1	General .....	29
B.2	Additional requirements .....	29
B.2.1	General .....	29
B.2.2	Performance requirements .....	29
B.3	Marking and operating instructions .....	29
B.4	Additional tests .....	29
Annex C (informative)	Example of an IFLS and explanation of upstream and downstream system leakage capacitances .....	30
C.1	Examples for the functions of an IFLS .....	30
C.2	Upstream and downstream system leakage capacitance .....	32
Bibliography	.....	33
Figure 1	– Test configuration: $I_L$ driven directly from the system to be monitored .....	21
Figure 2	– Test configuration: Active locating source .....	22
Figure 3	– Test configuration for current testing: Active locating source is used with a locating voltage above 50 V AC RMS and 70 V peak or 120 V DC .....	22
Figure C.1	– Example of an IFLS .....	31
Figure C.2	– Explanation of upstream and downstream system leakage capacitance .....	32
Table 1	– Abbreviated terms and symbols .....	12
Table 2	– Minimum IP requirements for IFLS .....	17
Table 3	– Reference conditions for testing .....	18
Table 4	– Climatic tests in operation .....	19
Table 5	– Climatic tests for storage .....	19
Table 6	– List of test conditions (TC) .....	19
Table 7	– Product mechanical test .....	24
Table 8	– Requirements and tests on IFLSs .....	25

Table A.1 – Additional requirements applicable to MED-IFLS.....	27
Table A.2 – Emission test for MED-IFLS .....	28

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP TO 1 000 V AC AND 1 500 V DC – EQUIPMENT FOR TESTING, MEASURING OR MONITORING OF PROTECTIVE MEASURES –****Part 9: Equipment for insulation fault location in IT systems**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 61557-9 has been prepared by IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) new terms and definitions on maximum admissible locating AC and DC currents and voltages;
- b) the requirements on locating current and locating voltage have been revised;

- c) performance requirements have been added;
- d) the test requirements for locating current and locating voltage have been revised;
- e) the structure of this document has been adapted to that of IEC 61557-1:2019;
- f) the limit values under Clause A.2 were adapted to fit the changed test methods in 6.2.3.

The text of this International Standard is based on the following documents:

Draft	Report on voting
85/896/FDIS	85/901/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

A list of all parts in the IEC 61557 series, published under the general title *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

# **ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP TO 1 000 V AC AND 1 500 V DC – 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 the insulation fault location system (IFLS) that localizes insulation faults in any part of the system in unearthed IT AC systems and unearthed IT AC systems with galvanically connected DC circuits having nominal voltages up to 1 000 V AC, as well as in unearthed IT DC systems with voltages up to 1 500 V DC, independent of the measuring principle.

NOTE 1 IT systems are described in IEC 60364-4-41. Further information on insulation fault location can be found in the following International Standards: IEC 60364-4-41:2005, 411.6 and IEC 60364-4-41:2005/AMD1:2017, 411.6, and IEC 60364-5-53:2019/AMD1:2020, 531.3.

NOTE 2 This document covers both passive IFLS and active IFLS. Active IFLS can be used in de-energised systems.

NOTE 3 This document does not cover IMD complying with IEC 61557-8.

### **2 Normative references**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60364-7-710:2021, *Low-voltage electrical installations – Part 7-710: Requirements for special installations or locations – Medical locations*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60721-3-1:2018, *Classification of environmental conditions – Part 3-1: Classification of groups of environmental parameters and their severities – Storage*

IEC 60721-3-2:2018, *Classification of environmental conditions – Part 3-2: Classification of groups of environmental parameters and their severities – Transportation and handling*

IEC 60721-3-3:2019, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 60947-5-4:2002, *Low-voltage switchgear and controlgear – Part 5-4: Control circuit devices and switching elements – Method of assessing the performance of low-energy contacts – Special tests*

IEC 60947-5-4:2002/AMD1:2019

IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61010-1:2010/AMD1:2016

IEC 61010-2-030, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Particular requirements for equipment having testing or measuring circuits*

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

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*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61326-1:2020, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

IEC 61326-2-2, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-2: Particular requirements – Test configurations, operational conditions and performance criteria for portable testing, measuring and monitoring equipment used in low-voltage distribution systems*

IEC 61326-2-4, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-4: Particular requirements – Test configurations, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8 and for equipment for insulation fault location according to IEC 61557-9*

IEC 61557-1:2019, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 1: General requirements*

IEC 61557-8:2014, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems*

IEC 61810-2:2017, *Electromechanical elementary relays – Part 2: Reliability*