

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Sécurité électrique dans les réseaux de distribution basse tension de 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



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 14 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 55 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Sécurité électrique dans les réseaux de distribution basse tension de 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

PRICE CODE
CODE PRIX

ICS 25.040.40

ISBN 978-2-8322-1976-8

**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 abbreviations	8
3.1 Terms, definitions, symbols and units	8
3.2 Abbreviations	10
4 Requirements	10
4.1 General requirements	10
4.2 Mandatory functions provided by an IFLS	11
4.2.1 Location warning	11
4.2.2 Local location warning (LLW)	11
4.2.3 Remote location warning (RLW)	11
4.3 Optional functions provided by IFLS	12
4.3.1 Indication of the insulation value	12
4.3.2 Performance of the IFLS in case of the interruption of the connection to the locating current sensor (LCS)	12
4.4 Performance requirements	12
4.4.1 Response sensitivity	12
4.4.2 Locating current I_L	12
4.4.3 Locating voltage U_L	12
4.5 Electromagnetic compatibility (EMC)	12
4.6 Safety requirements	12
4.6.1 General	12
4.6.2 Clearances and creepage distances	12
4.6.3 Protection class and earth connection of the IFLS	13
4.7 Climatic environmental conditions	13
4.8 Mechanical requirements	13
4.8.1 General	13
4.8.2 Product mechanical robustness	13
4.8.3 IP protection class requirements	14
5 Marking and operating instructions	15
5.1 Marking	15
5.2 Operating instructions	15
6 Tests	16
6.1 General	16
6.2 Type tests	16
6.2.1 General	16
6.2.2 Test of response sensitivity of the IFLS	16
6.2.3 Test of the locating current I_L	17
6.2.4 Test of the locating voltage U_L	17
6.2.5 Test of the location warning	17
6.2.6 Test of the indication of the insulation value	17
6.2.7 Test of the performance of the LCI	17
6.2.8 Voltage test	17
6.2.9 Test of the electromagnetic compatibility (EMC)	18
6.2.10 Test of the loss of LCS connection	18

6.2.11	Test of the protection class and the earth connection of the IFLS	18
6.2.12	Inspection of the marking and operating instructions.....	18
6.2.13	Mechanical test	18
6.2.14	Record of the type test	18
6.3	Routine tests.....	18
6.3.1	General	18
6.3.2	Test of the response sensitivity.....	18
6.3.3	Test of the location warning.....	19
6.3.4	Test of the self-test function	19
6.3.5	Voltage test	19
6.3.6	Compliance with the tests of Clause 6	19
7	Overview of requirements and tests for IFLSs.....	19
Annex A	(normative) Equipment for insulation fault location in medical locations	20
A.1	Scope	20
A.2	Requirements	20
A.2.1	General	20
A.2.2	Performance requirements.....	20
A.2.3	Electromagnetic compatibility (EMC)	20
A.3	Marking and operating instructions.....	20
A.4	Tests	21
A.4.1	General	21
A.4.2	Type tests.....	21
Annex B	(normative) Portable equipment for insulation fault location	22
B.1	Scope	22
B.2	Requirements	22
B.2.1	General	22
B.2.2	Performance requirements.....	22
B.3	Marking and operating instructions.....	22
B.4	Tests	22
Annex C	(informative) Example of an IFLS and explanation of upstream and downstream system leakage capacitances.....	24
C.1	Examples of an IFLS.....	24
C.2	Upstream and downstream system leakage capacitance.....	26
Bibliography		27
Figure C.1	– Example of an IFLS	25
Figure C.2	– Explanation of upstream and downstream system leakage capacitance	26
Table 1	– Abbreviations	10
Table 2	– Product mechanical requirements.....	14
Table 3	– Minimum IP requirements for IFLS	15
Table 4	– Reference conditions for tests in operation.....	16
Table 5	– Reference conditions for storage tests	16
Table 6	– Requirements and tests on IFLSs.....	19

Table A.1 – Additional requirements applicable to equipment for insulation fault location in medical locations	21
Table A.2 – Emission test for equipment for insulation fault location in medical locations	21

This document is a preview generated by EVS

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

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

This third edition cancels and replaces the second edition published in 2009. This edition constitutes a technical revision.

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

- a) the scope, normative references, terms and definitions have been complemented;
- b) abbreviations are listed and explained;
- c) requirements, marking and operating instructions have been revised;
- d) mandatory and optional functions have been defined and their terminology has been adapted to IEC 61557-15;

- e) mechanical requirements have been added;
- f) Clause 6 “Tests” has been revised;
- g) new Tables have been added.

The text of this standard is based on the following documents:

FDIS	Report on voting
85/486/FDIS	85/503/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This part of IEC 61557 shall be used in conjunction with Part 1.

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 a.c. and 1 500 V d.c. – 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 publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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) which localizes 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.

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 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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *Environmental testing – Part 2-1: Tests – Test A: Cold*

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

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

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

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

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

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

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 test, 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, *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, *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*

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

3 Terms, definitions and abbreviations

3.1 Terms, definitions, symbols and units

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

3.1.1

insulation fault location system

IFLS

device or combination of devices used for insulation fault location in IT systems, where the insulation fault location system is used in addition to an insulation monitoring device and is used to locate insulation faults

Note 1 to entry: An IFLS injects a locating current between the electrical system and earth.

3.1.2

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