

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 8: Insulation monitoring devices for 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 8: Contrôleur permanent 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.



IEC 61557-8

Edition 3.0 2014-12

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 8: Insulation monitoring devices for 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 8: Contrôleur permanent d'isolement pour réseaux IT

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

ICS 17.220.20; 29.080.01; 29.240.01

ISBN 978-2-8322-1973-7

**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.....	6
1 Scope.....	8
2 Normative references	8
3 Terms, definitions and abbreviations	9
3.1 Terms and definitions.....	9
3.2 Abbreviations.....	13
4 Requirements.....	13
4.1 General requirements	13
4.2 Types of IMDs.....	14
4.2.1 General	14
4.2.2 Mandatory functions provided by IMDs	14
4.2.3 Mandatory service function provided by the IMD – Test function	15
4.3 Optional functions provided by IMD.....	15
4.3.1 General	15
4.3.2 Local transformer monitoring warning (LTMW).....	15
4.3.3 Remote transformer monitoring warning (RTMW).....	15
4.3.4 Remote enabling and disabling command (REDC).....	16
4.4 Performance requirements.....	16
4.4.1 Specified response value R_{an}	16
4.4.2 System leakage capacitance C_e	16
4.4.3 Relative percentage uncertainty A of the specified response value R_{an}	16
4.4.4 Response time t_{an}	17
4.4.5 Measuring voltage U_m and measuring current I_m	17
4.4.6 Internal d.c. resistance R_i and internal impedance Z_i	17
4.4.7 Indication of the value of the insulation resistance R_F	18
4.4.8 Permanently admissible nominal voltage U_n	18
4.4.9 Permanently admissible extraneous d.c. voltage U_{fg}	18
4.4.10 Supply voltage U_S	18
4.5 Electromagnetic compatibility (EMC).....	18
4.6 Safety requirements.....	18
4.6.1 General	18
4.6.2 Clearances and creepage distances	19
4.6.3 Protection class and earth connection of an IMD	19
4.7 Climatic environmental conditions.....	19
4.8 Mechanical requirements	19
4.8.1 General	19
4.8.2 Product mechanical robustness	19
4.8.3 IP protection class requirements.....	20
5 Marking and operating instructions	21
5.1 Marking.....	21
5.2 Operating instructions.....	22
6 Tests.....	23
6.1 General.....	23
6.2 Type tests.....	23
6.2.1 General	23
6.2.2 Test of response values.....	23

6.2.3	Test of response time t_{an}	24
6.2.4	Test of peak value of the measuring voltage U_m	24
6.2.5	Test of the peak value of the measuring current I_m	24
6.2.6	Test of internal d.c. resistance R_i and internal impedance Z_i	25
6.2.7	Test of facilities for indicating the insulation resistance R_F	25
6.2.8	Test of effectiveness of the test device.....	25
6.2.9	Test of permanently admissible nominal voltage U_n	25
6.2.10	Test of permanently admissible extraneous d.c. voltage U_{fg}	25
6.2.11	Test of supply voltage U_s	26
6.2.12	Test of optional functions.....	26
6.2.13	Voltage tests.....	26
6.2.14	Test of electromagnetic compatibility (EMC).....	26
6.2.15	Inspection of the marking and operating instructions.....	26
6.2.16	Mechanical tests.....	26
6.3	Routine tests.....	27
6.3.1	General.....	27
6.3.2	Test of response values.....	27
6.3.3	Test of effectiveness of the test function.....	27
6.3.4	Test of facility for indicating the insulation resistance R_F	27
6.3.5	Voltage tests.....	27
6.3.6	Compliance with tests of 6.3.....	27
7	Overview of requirements and tests for IMDs.....	27
Annex A (normative)	Medical insulation monitoring devices (MED-IMD).....	29
A.1	Scope and object.....	29
A.2	Requirements.....	29
A.2.1	General.....	29
A.2.2	Types of MED-IMDs.....	29
A.2.3	Mandatory functions provided by MED-IMD.....	29
A.2.4	Performance requirements.....	30
A.2.5	Electromagnetic compatibility (EMC).....	31
A.3	Marking and operating instructions.....	31
A.4	Tests.....	32
A.4.1	General.....	32
A.4.2	Type tests.....	32
A.5	Overview of requirements and tests for MED-IMDs.....	32
Annex B (informative)	Monitoring of overload current and over-temperature.....	34
B.1	Scope and object.....	34
B.2	Requirements.....	34
B.2.1	General.....	34
B.2.2	Local transformer monitoring warning (LTMW) and/or remote transformer monitoring warning (RTMW).....	34
B.2.3	Monitoring of overload current.....	34
B.2.4	Monitoring of over-temperature of the IT system transformer.....	34
B.3	Operating instructions.....	35
B.4	Tests.....	35
B.4.1	General.....	35
B.4.2	Test of overload current and over-temperature monitoring.....	35
Annex C (normative)	Insulation monitoring devices for photovoltaic systems (PV-IMD).....	36
C.1	Scope and object.....	36

C.2	Requirements for PV-IMDs for PV installations	36
C.2.1	General	36
C.2.2	Types of PV-IMDs.....	37
C.2.3	Mandatory functions provided by PV-IMDs.....	37
C.2.4	Performance requirements.....	37
C.3	Marking and operating instructions.....	38
C.3.1	Marking	38
C.3.2	Operating instructions.....	39
C.4	Tests	39
C.4.1	General	39
C.4.2	Additional type tests	39
C.4.3	Additional routine tests	40
C.5	Overview of requirements and tests for PV-IMDs	40
Annex D (normative) Insulation monitoring function of a photovoltaic inverter (PV-IMF) or in a charge controller.....		41
D.1	Scope and object.....	41
D.2	Requirements for PV-IMFs.....	41
D.2.1	General requirements for PV-IMFs.....	41
D.2.2	Types of PV-IMFs	42
D.2.3	Mandatory functions provided by PV-IMFs	42
D.2.4	Performance requirements for PV-IMFs	43
D.2.5	Electromagnetic compatibility (EMC)	44
D.2.6	Safety requirements.....	44
D.2.7	Climatic environmental conditions.....	44
D.2.8	Mechanical requirements.....	44
D.3	Marking and operating instructions.....	44
D.3.1	Marking	44
D.3.2	Operating instructions.....	44
D.4	Tests	45
D.4.1	General	45
D.4.2	Type tests.....	45
D.4.3	Routine tests	46
D.5	Overview of requirements and tests for PV-IMF	46
Bibliography.....		47
Figure A.1 – Pictogram for marking a MED-IMD		32
Figure C.1 – Dynamic reference characteristics of d.c. PV system voltage.....		38
Figure C.2 – Pictogram for marking a PV-IMD.....		39
Table 1 – Abbreviations		13
Table 2 – Product mechanical requirements.....		20
Table 3 – Minimum IP requirements for IMDs.....		21
Table 4 – Pictograms for marking the type of IMD		22
Table 5 – Reference conditions for tests in operation.....		23
Table 6 – Reference conditions for storage tests (product not powered)		23
Table 7 – Requirements and tests applicable to IMD.....		28
Table A.1 – Summary of additional requirements and tests applicable to MED-IMDs.....		32

Table A.2 – Emission test for MED-IMDs 33
Table C.1 – Requirements and tests for PV-IMDs 40
Table D.1 – Requirements and tests for PV-IMF integrated in the inverter 46

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 8: Insulation monitoring devices for 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 61557-8 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 2007. This edition constitutes a technical revision.

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

- a) Terms and definitions have been complemented;
- b) Abbreviations are listed and explained;
- c) Requirements have been revised;
- d) Mandatory and optional functions and their terminology have been adapted from IEC 61557-15;

- e) Mechanical requirements have been added;
- f) Information on operating instructions has been added;
- g) Type tests and routine tests have been complemented;
- h) An Annex C: 'Insulation monitoring devices for photovoltaic systems (PV-IMD)' has been added;
- i) An Annex D: 'Insulation monitoring function of a photovoltaic inverter (PV-IMF) or in a charge controller' has been added.

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

FDIS	Report on voting
85/485/FDIS	85/502/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 8: Insulation monitoring devices for IT systems

1 Scope

This part of IEC 61557 specifies the requirements for insulation monitoring devices (IMD) which permanently monitor the insulation resistance R_F to earth of unearthed a.c. IT systems, of a.c. IT systems with galvanically connected d.c. circuits having nominal voltages up to 1 000 V a.c., as well as of unearthed d.c. IT systems with voltages up to 1 500 V d.c. independent from the method of measuring.

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

NOTE Various standards specify the use of IMDs in IT systems. In such cases, the objective of the equipment is to signal a drop in insulation resistance R_F below a minimum limit.

IMDs according to this part of IEC 61557 can also be used for de-energized TT, TN and IT systems or appliances.

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 60691, *Thermal-links – Requirements and application guide*

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: Classification of groups of environmental parameters and their severities – Section 3: Stationary use at weatherprotected locations*

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

IEC 60947-5-4, *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 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 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, *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 61810-2, *Electromechanical elementary relays – Part 2: Reliability*

IEC 62109-2:2011, *Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters*

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

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1

extraneous d.c. voltage

U_{fg}

d.c. voltage occurring in a.c. systems between the a.c. conductors and earth (derived from d.c. parts)

3.1.2

insulation resistance

R_F

resistance in the system being monitored, including the resistance of all the connected appliances to earth

3.1.3

response value

R_a

value of the insulation resistance at which the device responds under specified conditions