IEC 61557-1

Edition 3.0 2019-07
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

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 61557-1:2019-07 RLV(en)

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CONTENTS

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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

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.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 61557-1 has been prepared by 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 third edition includes the following significant technical changes with respect to the previous edition:

a) terms aligned with IEC 60050;
b) measurement of uncertainty revised according to the equations in 4.2 of ISO/IEC Guide 98-3:2008 (GUM);
c) updated references for safety and EMC requirements;
d) updated references for marking and operating instructions;
e) updated references for testing safety and EMC;
f) Annex A contains an explanation of GUM;
g) Annex B addresses environmental aspects.

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

FDIS	Report on voting
85/689/FDIS	85/692/RVD

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

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

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 "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

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INTRODUCTION

IEC 60364-6~~:2006,~~ stipulates standardized conditions for the initial test of power installations in TN, TT or IT ~~(IEC 60364)~~ systems for continuous monitoring and for testing these installations after modifications. In addition to general references for the ~~execution~~ performance of the tests, IEC 60364-6 contains requirements that have to be verified by measurements. Only in a few instances, for example when measuring the insulation resistance, ~~the standard contains~~ does IEC 60364-6 contain details of the characteristics of the measuring device to be used. Circuits which are given as examples in IEC 60364-6, and referred to within the text of that document, are generally not suitable for practical use.

The tests are carried out in installations where hazardous voltages can occur and where careless use or a defect in the equipment can easily cause an accident. Therefore, the technician has to rely on measuring devices which ensure~~, apart from simplification of the measurements,~~ safe test methods, in addition to simplifying the measurements.

The application of the general safety regulations for electrical and electronic measuring devices (IEC 61010-1) for testing the protective measures is not sufficient in itself. The ~~execution~~ performance of measurements in the installation can cause hazards not only to the technician, but also to third persons, depending on the measuring method~~, also to third persons~~ used.

Likewise, reliable and comparable results of measurement with measuring devices from different manufacturers are an important precondition in order to obtain an objective ~~judgement~~ assessment about the installation, for example when the installation is handed over for periodic tests, for continuous insulation monitoring or in the case of performance warranty.

The IEC 61557 series has been established with the aim of stipulating common principles for measuring and monitoring equipment for testing electrical safety and measuring performances in systems with nominal voltages up to 1 000 V AC and 1 500 V DC which correspond to the above-mentioned characteristics.

For that reason, the following common ~~specifications~~ requirements have been stipulated in ~~Part 1 and other individual parts of the series of standards~~ IEC 61557-1 (other parts of IEC 61557 can specify additional requirements or deviations):

– protection against extraneous voltages;
– class II protection (except insulation monitoring devices and insulation fault location systems);
– ~~specifications~~ requirements and safety precautions against hazardous touch voltages at the measuring device;
– ~~specifications~~ requirements for the ~~judgement~~ assessment of connection configurations with respect to wiring errors in the tested equipment;
– special mechanical requirements;
– measuring methods;
– measured quantity;
– specification of the maximum operating uncertainty;
– ~~specifications~~ requirements for testing the influencing quantity and the calculation of the ~~operational~~ operating uncertainty;
– uncertainties of the measuring device at the thresholds specified in the respective standards;
– specification of the nature of type and routine tests and the required conditions for testing.

Contrary to the usual convention, terms and definitions that occur more than once in another part of the series are listed in IEC 61557-1:2019, Clause 3. Only terms and definitions specific to the respective part of IEC 61557 are listed in Clause 3 of that part.

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

1 Scope

This part of IEC 61557 specifies the general requirements ~~for~~ applicable to measuring and monitoring equipment for testing the electrical safety in low-voltage distribution systems with nominal voltages up to 1 000 V AC and 1 500 V DC.

When measuring equipment or measuring installations involve measurement tasks of various measuring equipment covered by this series of standards, then the part of this series relevant to each of the measurement tasks is applicable.

NOTE The term "measuring equipment" will hereafter be used to designate "testing, measuring and monitoring equipment".

Other parts of IEC 61557 can specify additional requirements or deviations.

This document does not cover functional safety or cybersecurity.

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 60038:~~1983~~ [1)] 2009, *IEC standard voltages*
~~Amendment 1: 1994~~
~~Amendment 2: 1997~~

~~IEC 60364-6:2006, *Electrical installations of buildings – Part 6: Verification*~~

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

IEC 60529:~~2001~~1989, *Degrees of protection provided by enclosures (IP code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013[2]

IEC 61010-1:~~2001~~2010, *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements*
IEC 61010-1:2010/AMD1:2016[3]

~~1) There exists a consolidated edition (6.2), which includes IEC 60038:1983 and its Amendments 1 (1994) and 2 (1997).~~

2 A consolidated version of this publication exists, comprising IEC 60529:1989, IEC 60529:1989/AMD1:1999 and IEC 60529:1989/AMD2:2013.

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

IEC 61010-2-030:2017, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: ~~Special~~ Particular requirements for equipment having testing ~~and~~ or measuring circuits*~~[4)]~~

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 61010-2-034:2017, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-034: Particular requirements for measurement equipment for insulation resistance and test equipment for electric strength*

IEC 61326-1:2012, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

~~IEC 61326-2-2:2005, *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 61326-2-4:2006, *Electrical equipment for measurement, control and laboratory use, - EMC requirements – Part 2: 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 61557-2, *Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 2: Insulation resistance*~~

~~IEC 61557-3, *Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 3: Loop impedance*~~

~~IEC 61557-4, *Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 4: Resistance of earth connection and equipotential bonding*~~

~~IEC 61557-5, *Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 5: Resistance to earth*~~

~~IEC 61557-6, *Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 6: Residual current devices (RCD) in TT and TN systems*~~

~~IEC 61557-7, *Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 7: Phase sequence*~~

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3 A consolidated version of this publication exists, comprising IEC 61010-1:2010 and IEC 61010-1:2010/AMD 1:2016.

~~4) To be published.~~

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 61557-9:2014, *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 9: Equipment for insulation fault location in IT systems*

~~IEC 61557-10, *Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 10: Combined measuring equipment for testing, measuring or monitoring of protective measures*~~

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
nominal system voltage ~~of the distribution system~~
U_n
value of the voltage by which the distribution system ~~or equipment~~ is designated and to which certain ~~operating~~ characteristics are ~~referred~~ assigned

~~[IEC 60038, Clause 1, modified]~~

~~**3.2**~~
~~**operating voltage in a system**~~
~~the value of the voltage under normal conditions, at a given instant and a given point of the system~~

~~[IEV 601-01-22, modified]~~

3.2
voltage against earth
U_o
<in distribution systems with an earthed neutral point> voltage between a phase conductor and the earthed neutral point

3.3
voltage against earth
U_o
<in all other distribution systems> voltage present between the remaining phase conductors and earth when one of the phase conductors is ~~shorted~~ short-circuited to earth

3.4
fault voltage
U_f
~~voltage appearing under fault conditions between exposed conductive parts (and/or extraneous conductive parts) and earth~~
voltage between a given point of fault and reference earth resulting from an insulation fault

[SOURCE: IEC 60050-826:2004, 826-11-02, modified – The symbol has been added.]

3.5
~~(~~effective~~)~~ touch voltage
U_t
voltage between conductive parts when touched simultaneously by a person or an animal

Note 1 to entry: The value of the effective touch voltage may be appreciably influenced by the impedance of the person or the animal in electric contact with these conductive parts.

~~[IEV 826-11-05]~~

[SOURCE: IEC 60050-195:1998, 195-05-11, modified – The symbol has been added.]

3.6
conventional touch voltage limit
U_L
maximum value of the touch voltage which is permitted to be maintained indefinitely in specified conditions of external influences and is usually equal to 50 V AC, RMS or 120 V ripple free DC

~~[IEV 826-02-04, modified]~~

[SOURCE: IEC 60050-826:2004, 826-11-04, modified – "prospective" has been omitted from the term and from the definition and values for the limit have been added to the definition; the symbol has been added.]

~~**3.7**~~
~~**rated range of voltages**~~
~~voltage range for which the measuring and monitoring equipment is intended to be used and for which it has been designed~~

3.7
supply voltage
voltage that is used to power the measurement equipment

Note 1 to entry: If a supply voltage is specified, for instance in the supply contract, then it is called "declared supply voltage".

3.8
rated supply voltage
U_S
value of the supply voltage at a point where the measuring equipment does or can accept electric energy as a supply

3.9
output voltage
U_a
voltage across the measuring equipment terminals where this equipment does or can output electric energy

3.10
open-circuit voltage
U_q
voltage present across unloaded terminals on the measuring equipment

~~**3.11**~~
~~**rated voltage of measuring equipment**~~
~~U_{ME}~~
~~voltage for which the measuring equipment is intended to be used and the value of which is marked on the equipment~~

3.11
rated voltage
U_N
voltage value assigned by a manufacturer or other entity for a specified operating condition of the measuring equipment

Note 1 to entry: The value for the rated voltage of low-voltage equipment is generally assigned from the list of nominal voltages in IEC 60038:2009, Tables 1 and 6.

Note 2 to entry: Equipment may have more than one rated voltage value or may have a rated voltage range.

[SOURCE: IEC 60050-614:2016, 614-03-09, modified – The domain <of equipment> and Note 1 have been omitted; the symbol has been added; the term specifically adapted for measuring equipment.]

3.12
extraneous voltage
external voltage to which the measuring equipment can be subjected ~~by external influences~~ during measurement. ~~This is not required for the operation of the measuring equipment, but can interfere with its operation~~

3.13
rated current
I_N
~~current of the measuring equipment under rated conditions~~
current assigned by the manufacturer for the specified operating condition of the measuring equipment

Note 1 to entry: The specified operating condition is a value (or values) within the rated operating conditions that are designated by the manufacturer.

[SOURCE: IEC 60050-442:1998, 442-01-02, modified – "for accessories" has been deleted from the term and Note 1 has been added; the definition has been adapted for application to measuring equipment.]

3.14
short-circuit current
~~I_k~~
~~current flowing across the short-circuited terminals of the measuring equipment~~
over-current resulting from a short circuit due to a fault on the terminals or within the measuring equipment

3.15
rated frequency
f_N
frequency for which the measuring equipment is intended to be used and for which it has been designed

~~**3.16**~~
~~**earth**~~
~~the conductive mass of the earth whose electric potential at any point is conventionally taken as equal to zero~~

~~[IEV 826-04-01]~~

~~**3.17**~~
~~**earth electrode**~~
~~a conductive part or group of conductive parts in intimate contact with and providing an electrical connection with earth~~

~~[IEV 826-04-02]~~