IEC 61243-3

Edition 2.0 2009-11

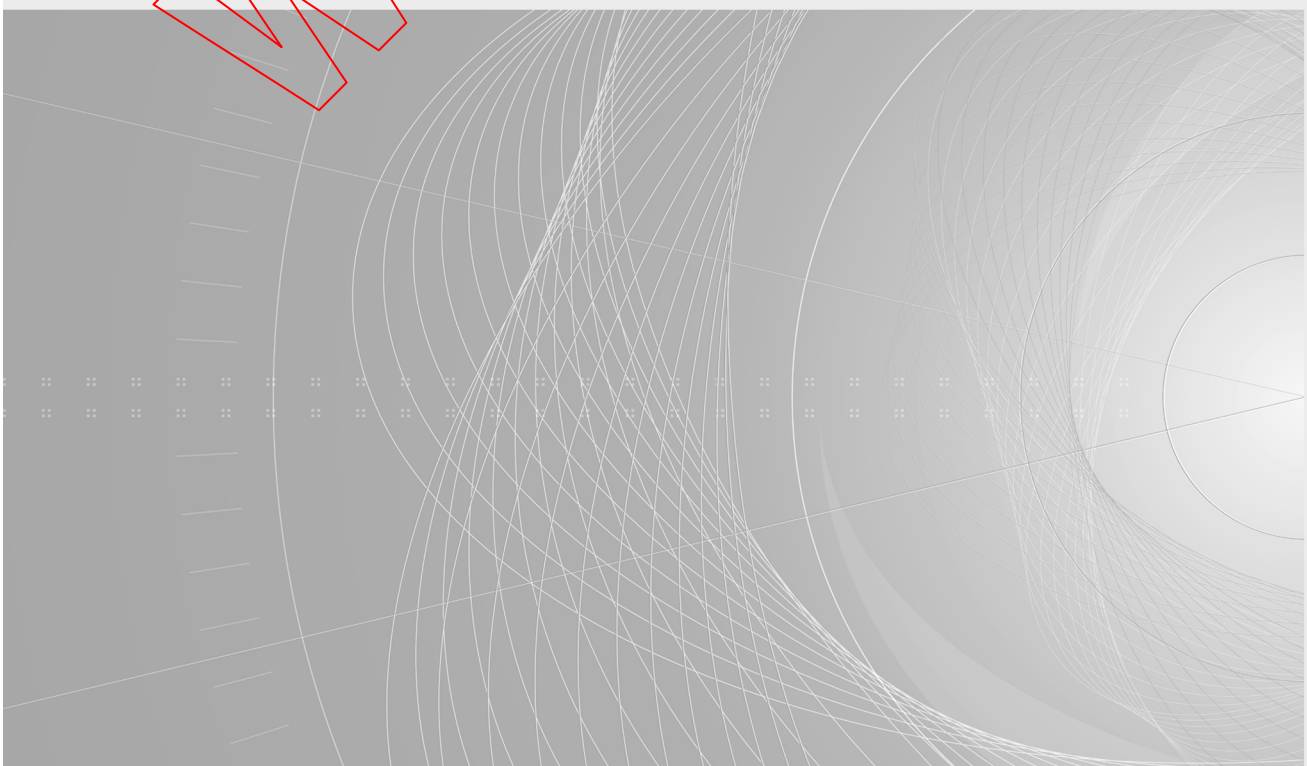
INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Live working – Voltage detectors – Part 3: Two-pole low-voltage type

Travaux sous tension – Détecteurs de tension – Partie 3: Type bipolaire basse tension



IEC 61243-3:2009

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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International Standard IEC 61243-3 has been prepared by IEC technical committee 78: Live working.

This second edition cancels and replaces the first edition published in 1998. It is a technical revision.

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

– no more switches are allowed for scale change;
– all the voltage detectors are now for use indoor and outdoor excluding the use under rain conditions;
– no contact electrode which has the construction of a hook is allowed;
– no more voltage classes (A and B) are considered;
– the concept of double or reinforced insulation design (or constructional arrangements providing an equivalent protection) is added;

– for testing, the consideration of normal and single fault conditions is added;
– EMC requirements and tests are upgraded;
– the influence of interference voltage is now considered;
– the classification of the voltage detector into an overvoltage category is increased to at least category III;
– the protection against electrical stresses is reinforced (transient and temporary overvoltages);
– the degree of protection provided by all the enclosures (IP code) is increased to be at least IP54, unless otherwise specified;
– the requirement and test for switches for temporary loading have been reviewed;
– the requirement for ELV indication has been reviewed (a redundant non-disconnectable indicating system is not anymore the unique means allowed);
– the ranges of climatic conditions for operation of voltage detectors of category N and of category S have been reviewed;
– the ball pressure test now refers to IEC 60695-10-2;
– a wear test concerning the insulating material of the lead(s) is added;
– the conformity assessment of voltage detectors having completed the production phase is added;
– the normative annex on supplementary functions has been reviewed;
– the normative annex on sampling plans and procedure has been deleted (not applicable according to IEC 61318);
– the informative annex on acceptance tests has been deleted (consideration now included in IEC 61318).

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

FDIS	Report on voting
78/821/FDIS	78/832/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.

A list of all parts of the IEC 61243 series can be found, under the general title *Live working – Voltage detectors*, on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

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

INTRODUCTION

The devices covered by this standard are designed to be used in a live working environment to determine the status (presence or absence of operating voltage) of low-voltage installations.

The live working environment comes with its specific hazards and working conditions which are generally more severe than the ones encountered by workers in other fields than live working.

This International Standard is a product standard giving essential requirements and tests to verify that the devices perform well and will contribute to the safety of the users, provided they are used by skilled persons, and according to safe working procedures and to local or national regulations.

Voltage detectors are not considered as measuring or testing devices, separately covered by IEC 61010 series. However, in case of misuse by general electrical workers, the requirements and tests included in this document are intended to achieve an equivalent level of safety.

To take into consideration the specific needs of a live working environment, the following differences exist with IEC 61010 series:

– some requirements and tests exist in both standards but with different sanctions or pass test criteria (see A.1);
– some requirements of IEC 61010 are not included in this standard with the rationale (see A.2);
– some additional requirements of this standard are not specified in IEC 61010 with the rationale (see A.3).

This International Standard has been prepared according to the requirements of IEC 61477, where applicable.

The product covered by this standard may have an impact on the environment during some or all stages of its life cycle. These impacts can range from slight to significant, be of short-term or long-term, and occur at the global, regional or local level.

This standard does not include requirements and test provisions for the manufacturers of the product, or recommendations to the users of the product for environmental improvement. However, all parties intervening in its design, manufacture, packaging, distribution, use, maintenance, repair, reuse, recovery and disposal are invited to take account of environmental considerations.

LIVE WORKING – VOLTAGE DETECTORS –

Part 3: Two-pole low-voltage type

1 Scope

This part of IEC 61243 is applicable to hand-held two-pole voltage detectors with its accessories (crocodile clips and detachable leads) to be used in contact with parts of electrical systems:

– for a.c. voltages not exceeding 1 000 V at nominal frequencies between 16 2/3 Hz and up to 500 Hz,

and/or

– for d.c. voltages not exceeding 1 500 V.

NOTE The a.c. voltages defined in this standard refer either to phase-to-phase voltages or phase to neutral voltages.

Contact electrode extensions are not covered by this standard.

Voltage detectors covered by this standard are intended to be used under dry and humid conditions, both indoor and outdoor. They are not intended to be used under rain conditions.

Voltage detectors covered by this standard are not intended to be used for continuous operation.

Voltage detectors covered by this standard are intended to be used up to 2 000 m above sea level.

This standard also includes provisions for the following supplementary functions when available (see Annex B):

– phase indication,
– rotating field indication, and
– continuity check.

Other supplementary functions are not covered by this standard.

Voltage detectors covered by this standard are not considered as measuring devices. Relevant safety requirements for measuring devices are included in IEC 61010 series.

2 Normative references

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

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

IEC 60068-2-31:2008, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60068-2-75:1997, *Environmental testing – Part 2: Tests – Test Eh: Hammer tests*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60304, *Standard colours for insulation for low-frequency cables and wires*

IEC 60417, *Graphical symbols for use on equipment*

IEC/TS 60479-1:2005, *Effects of current on human beings and livestock – Part 1: General aspects*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
Amendment 1:1999[1]

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

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

IEC 60695-10-2:2003, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*

IEC 60942, *Electroacoustics – Sound calibrators*

IEC 61010-031:2002, *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 031: Safety requirements for hand-held probe assemblies for electrical measurement and test*
Amendment 1:2008[2]

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

IEC 61140:2001, *Protection against electric shock – Common aspects for installation and equipment*
Amendment 1:2004

IEC 61180-1, *High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements*

IEC 61180-2, *High-voltage test techniques for low-voltage equipment – Part 2: Test equipment*

IEC 61260, *Electroacoustics – Octave-band and fractional-octave-band filters*

IEC 61318, *Live working – Conformity assessment applicable to tools, devices and equipment*

IEC 61326-1:2005, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

IEC 61477, *Live working – Minimum requirements for the utilization of tools, devices and equipment*

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[1] There exists a consolidated edition 2.1 (2001) that includes Edition 2 and its Amendment 1.

[2] There exists a consolidated edition 1.1 (2008) that includes Edition 1 and its Amendment 1.

IEC 61557-7:2007, *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 7: Phase sequence*

IEC 61672-1, *Electroacoustics – Sound level meters – Part 1: Specifications*

ISO 286-1, *ISO system of limits and fits – Part 1: Bases of tolerances, deviations and fits*

ISO 286-2, *ISO system of limits and fits – Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*

ISO 354, *Acoustics – Measurement of sound absorption in a reverberation room*

ISO 3744:1994, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane*

ISO 3745, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for anechoic and hemi-anechoic rooms*

ISO 7000:2004, *Graphical symbols for use on equipment – Index and synopsis*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61318 and the following apply.

3.1
basic insulation
insulation applied to live parts of a voltage detector to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes (3.10.1 of IEC 61140).

[3.17.2 of IEC 60664-1, modified]

3.2
clear indication
unambiguous detection and indication of the voltage state between the contact electrodes

[IEV 651-10-10, modified]

3.3
clear perceptibility
case where the indication is unmistakably discernible by the user under specific environmental conditions when the voltage detector is in its operating position

3.4
contact electrode
conductive part of the probe which establishes the electric connection to the part to be checked

[IEV 651-10-09, modified]

NOTE In certain designs, a part of the contact electrode is covered with insulating material.

3.5
extra low voltage
ELV
voltage below 50 V a.c. or 120 V d.c.

3.6
hand-guard
distinctive physical barrier (fixed to or part of the probe) to prevent the fingers or hands of the operator from inadvertently touching the contact electrode or any energized part

3.7
hazardous live
capable of rendering an electrical shock or electrical burn in normal condition or single fault condition

3.8
indicating voltage
U_i
approximate value of the operating voltage identified by the voltage detector

NOTE The indicating voltage of the voltage detector is the parameter associated with its clear indication. Certain types of voltage detectors may have several indicating voltages and/or several indicating voltage ranges. Limit values of a voltage range are named U_i min. and U_i max.

3.9
indicator
part of the voltage detector which indicates the presence of the operating voltage between the contact electrodes

[IEV 651-10-08, modified]

NOTE The indicator may provide as well information related to supplementary functions.

3.10
inspection
conformity evaluation by observation and judgement, accompanied as appropriate by measurement, testing, gauging or calculation

[3.8.2 of ISO 9000, modified]

3.11
interference voltage
voltage at power frequency picked up inductively or capacitively by the part to be tested

3.12
internal energy source
integrated functional power supply

3.13
lead
flexible cable connecting different components of the voltage detector together

3.14
normal condition
condition in which all means of protection are intact

[2.7 of IEC Guide 104]

3.15
operating current
minimum value of current required to operate the different indicating systems

3.16
probe
insulated part of a voltage detector intended to be handled by the user to bring its contact electrode in contact with the component to be checked

NOTE 1 The probe may contain the indicator.

NOTE 2 The probe does not include a lead. The probe and the lead may be detachable or not.

3.17
protective impedance
component, assembly of components or the combination of basic insulation and a current or voltage-limiting device, whose impedance, construction and reliability are such that, when connected between accessible conductive parts which are hazardous when live, it provides protection to the extent required by this standard in normal condition and single fault condition

3.18
reasonably foreseeable misuse
use of a product, process or service in a way not intended by the supplier, but which may result from readily predictable human behaviour

[3.14 of ISO/IEC Guide 51]

3.19
recovery time
r_t
minimum no-load time between two uses as specified by the manufacturer

3.20
response time
time delay between a sudden change of the voltage state between the contact electrodes and the associated clear indication

3.21
single fault condition
condition in which one means of protection against hazards is defective, or one fault is present which could cause a hazard

NOTE If a single fault condition results unavoidably in one or more other fault conditions, all are considered as one single fault condition.

[2.8 of IEC Guide 104]

3.22
temporary overvoltage
power frequency overvoltage of relatively long duration

NOTE This overvoltage is undamped or weakly damped. In some cases its frequency may be several times smaller or higher than power frequency.

[IEV 604-03-12]

3.23
testing element
built-in element or separate device, by means of which the functioning of the voltage detector can be checked by the user

[IEV 651-10-11, modified]

3.24
threshold voltage
U_t
minimum voltage between the two contact electrodes required to give a clear indication

3.25
time rating
t_r
specified on-load time during which the voltage detector is able to operate correctly

3.26
transient overvoltage
a short duration overvoltage of few milliseconds or less, oscillatory or non-oscillatory, usually highly damped

[IEV 604-03-13]

3.27
two-pole voltage detector
voltage detector for bi-polar application, made of two probes, an indicator included or not in one of the probes and lead(s)

NOTE The term voltage detector is used in this document for two-pole low voltage detector.

3.28
voltage detector (for live working)
device used to provide clear evidence of the presence or absence of the operating voltage

[adapted from 11.2.5 of IEC 60743 and IEV 651-10-04]

4 Requirements

4.1 General requirements

4.1.1 Safety

Voltage detectors covered by this standard shall be designed and manufactured in order to contribute to the safety of the users, provided the voltage detectors are used by skilled persons, in accordance with safe methods of work and the instructions for use.

4.1.2 Indication

The voltage detector shall give a clear indication of the state "voltage present" of the operating voltage by means of the status change of the signal. The indication shall be visual. An audible indication is optional. Simultaneous indications shall be provided when the voltage detector has more than one system of indication.

The visual indication (display) can be of different types but the clear indication of the presence of the operating voltage shall not display a discrete voltage value.

NOTE 1 Displays could consist of: change of the lighting state of LED(s), movement of a needle or of other current activated component, alphanumeric characters on a screen, etc.

NOTE 2 Displays providing a discrete voltage value are considered as supplementary measuring functions and should fulfil the relevant standards.