IEC 62271-213

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

High-voltage switchgear and controlgear – Part 213: Voltage detecting and indicating system

Appareillage à haute tension – Partie 213: Système détecteur et indicateur de tension

IEC 62271-213:2021-06(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 213: Voltage detecting and indicating system

FOREWORD

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International Standard IEC 62271-213 has been prepared by subcommittee 17C:Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear.

This first edition cancels and replaces the first edition of IEC 61243-5 published in1997 and the first edition of IEC 62271-206 published in 2011. This edition constitutes a merging of the content of IEC 61243-5 and IEC 62271-206.

This edition includes the following significant technical changes with respect to the previous editions of IEC 61243-5 and IEC 62271-206:

a) an optional output signal is defined to be used for multipurpose use cases;
b) only one *interface* is defined for *voltage detecting and indicating system* (*VDIS*);
c) the measurement of the current carrying capacity of the *voltage limiting element* is considered as inaccurate and is not considered in this document. Experience shows that the probability of failure of the *coupling element* is negligible.

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

FDIS	Report on voting
17C/787/FDIS	17C/794/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. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

In this document, the following print types are used:

- Terms defined in Clause 3*: in italic type*.

The reader's attention is drawn to the fact that Annex B lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

A list of all parts in the IEC 62271 series, published under the general title *High-voltage switchgear and controlgear*, 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 in the data related to the specific document. At this date, the document will be

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- withdrawn,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

INTRODUCTION

This part of IEC 62271 has been prepared in accordance with the requirements of IEC 62271-1.

The products designed and manufactured in accordance with this document contribute to the safety of the users, provided they are used by skilled or instructed persons, in accordance with safe methods of work and the instructions for use.

The product covered by this document can 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 duration, and occur at the global, regional or local level.

IEC 62271-213 does not cover the phase comparison function of IEC 61243-5 which is covered by the new IEC 62271-215. Unless IEC 62271-215 is not published, the relevant subclauses in IEC 61243-5 related to UPCs are applicable.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 213: Voltage detecting and indicating system

1 Scope

This part of IEC 62271 is applicable to the *voltage detecting and indicating system* (*VDIS*) to be installed on indoor and outdoor high-voltage *equipment*.

The *VDIS* as defined by this document includes a *coupling system* per phase (capacitive, resistive coupling or other technology) to connect to live parts (*main circuit*).

The *VDIS* is applicable on systems with *nominal voltage*s above 1 kV and service frequencies from 16,7 Hz up to and including 60 Hz. The *VDIS* is used to detect and indicate the presence or absence of *operating voltage*. It is not intended to distinguish between voltage not present (i.e. U < 10 % of *nominal voltage*) and dead circuit state (i.e. U = 0 V).

NOTE 1 The use of a specific means of connection to earth of the *main circuit* (e.g. by an earthing switch) provides the "dead circuit" (U = 0 V) state.

NOTE 2 The *VDIS* has the same threshold values as the voltage presence indicating system (VPIS) (IEC 62271-206) and the voltage detecting system (VDS) (IEC 61243-5) for not indicating presence of voltage and for detecting an absence of *operating voltage*, respectively.

The *VDIS* is fixed on *equipment* such as switchgear and controlgear according to the IEC 62271 series or transformers according to their own standards.

The products designed and manufactured in accordance with this document contribute to the safety of the users, provided they are used by skilled or instructed persons in accordance with safe methods of work and the instructions for use.

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 60060-1, *High-voltage test techniques – Part 1: General definitions and requirements*

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 60068-2-11, *Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist*

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

IEC 60068-2-38, *Environmental testing – Part 2-38: Tests – Test Z/AD: Composite temperature/humidity cyclic test*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60352-1, *Solderless connections – Part 1: Wrapped connections; general requirements, test methods and practical guidance*

IEC 60352-2, *Solderless connections – Part 2: Solderless crimped connections – General requirements, test methods and practical guidance*

IEC 60352-5, *Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance*

IEC 60417, *Graphical symbols for use on equipment* (available at http://www.graphical-symbols.info/equipment)

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

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61010-031:2015, *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*
IEC 61010-031:2015/AMD1:2018

IEC 61210, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

IEC 62271-1, *High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear*

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:

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

3.1
active signal
audible or visual phenomenon of the *VDIS* whose presence, absence or variation is considered as representing information on the condition “voltage present” or “voltage not present”

[SOURCE: IEC 61243-1:2021 [15][1], 3.2, modified – "of the VDIS" is added, the Note 1 to entry is removed.]

3.2
adjustment element
part of the *coupling system*, connected to the earth, which is used to modify the signal of the *coupling element*

Note 1 to entry: Different components can be used for the *adjustment element*, for example, capacitive, resistive, or other.

3.3
connecting lead
element of the *VDIS* which provides electrical connection between the *coupling element* and all other parts being used in the construction of the *VDIS*

Note 1 to entry: The other parts can be, for example, the *testing points* and connecting points, integrated *indicator*, etc.

3.4
connecting point
rear accessible point of the *VDIS* which provides access to the signal

3.5
coupling element
part of the *coupling system* which establishes the connection with the *main circuit*

Note 1 to entry: Different physical principles can be used for the *coupling element*, for example, capacitive or resistive.

3.6
coupling system
part of the *VDIS* connected between the *main circuit* and earth, which transmits a signal to the indicating element

Note 1 to entry: The *coupling system* is generally designed as a voltage divider.

3.7
equipment
single apparatus or set of devices or apparatuses, or the set of main devices of an installation, or all devices necessary to perform a specific task

Note 1 to entry: The *VDIS* is used to be fixed on *equipment* such as switchgear and controlgear as per the IEC 62271 series or transformers according to their own standard.

[SOURCE: IEC 60050-151:2001 [1], 151-11-25, modified – the Note has been replaced by a new Note 1.]

3.8
equivalent threshold voltage
U_{et}
value of the *operating voltage* at the *main circuit* in the case of a test, when the *measuring voltage* has reached the *threshold voltage*

3.9
front
part of the *VDIS* accessible during functional operation

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1 Numbers in square brackets refer to the Bibliography.

3.10
indicator
part of the *VDIS* which indicates the voltage state of the *main circuit*

Note 1 to entry: The *indicator* can be an indicating element in case of an in*tegrated VDIS* or an indicating device in case of a separated *VDIS*.

3.11
input impedance
X_c
impedance of the input circuit measured between the input terminals under *normal operating conditions*

Note 1 to entry: The impedance can be expressed in terms of admittance.

Note 2 to entry: The impedance can be either linear or non-linear.

[SOURCE: IEC 60050-312:2001 [2], 312-06-18, modified – Note 2 is removed, Note 3 is simplified and becomes Note 2, and the symbol "X_c" has been added.]

3.12
interface
boundary between two functional units, defined by functional characteristics, signal characteristics, or other characteristics as appropriate

Note 1 to entry: *Interfaces* refer to *testing point* and *connecting point* characteristics.

[SOURCE: IEC 60050-351:2013 [3], 351-42-25, modified – the notes are replaced by a new Note 1 to entry.]

3.13
main circuit (of an assembly)
all the conductive parts of an assembly included in a circuit which is intended to transmit electrical energy

Note 1 to entry: In this document, the *main circuit* is at high voltage above 1 kV.

[SOURCE: IEC 60050-441:2000 [4], 441-13-02, modified – Note 1 is added.]

3.14
line-to-earth voltage
U_{LE}
voltage between a line conductor and reference earth at a given point of an electric circuit

[SOURCE: IEC 60050-826:2004 [8], 826-11-08, modified – the symbol "U_{LE}" has been added.]

3.15
maintenance test
test carried out periodically on an item to verify that its performance remains within specified limits, after having made certain adjustments, if necessary

[SOURCE: IEC 60050-151:2001 [1], 151-16-25]

3.16
measuring voltage
U_m
value of the voltage measured at the *testing point* or the *connecting point* if it exists

3.17
mid-point earthed single-phase system
type of single-phase power transmission system, which is mid-point earthed, for example at secondary transformer output

Note 1 to entry: The *nominal voltage* of a *mid-point earthed single-phase system* is the voltage between phase to phase with 180° between the phases.

3.18
nominal voltage
U_n
value of the voltage by which the electrical installation, part of the electrical installation or device is designated and identified

Note 1 to entry: The *nominal voltage* of the *VDIS* is the parameter associated with its clear indication. The *VDIS* can be used at one *nominal voltage* U_n, or at a *nominal voltage* range. Limit values of the *nominal voltage* range are named $U_{n\,min}$ and $U_{n\,max}$.

Note 2 to entry: In this document, the *nominal voltage* of a three-phase system is the phase-to-phase voltage. The *nominal voltage* of a single-phase system is the voltage between phase and earth. The *nominal voltage* of a mid-point earthed system is the voltage between phase to phase with a phase shift of 180° between the phases.

[SOURCE: IEC 60050-826:2004 [8], 826-11-01, modified – the entry has been modified, removed “(of an electrical installation)”; added “device”, and the Notes have been added.]

3.19
normal operating condition
operating condition that represents as closely as possible the range of normal use that can reasonably be expected

[SOURCE IEC 60050-903:2014 [9], 903-01-21]

3.20
operating voltage
value of the voltage under *normal operating conditions*, at a given instant and a given point of the system

Note 1 to entry: This value can be expected, estimated or measured.

[SOURCE: IEC 60050-601:1985[6], 601-01-22, modified – replaced "normal conditions" with "*normal operating conditions"*.]

3.21
plug
accessory having pins designed to engage with the contacts of a *socket-outlet*, also incorporating means for the electrical connection and mechanical retention of flexible cables or cords

[SOURCE IEC 60050-442:1998 [5], 442-03-01]

3.22
power-frequency withstand voltage
RMS value of sinusoidal power-frequency voltage that the insulation of the given *equipment* can withstand during tests made under specified conditions and for a specified duration

[SOURCE: IEC 60050-614:2016 [7], 614-03-22]

3.23
rated value
value of a quantity used for specification purposes, established for a specified set of operating conditions of a component, device, *equipment* or system

[SOURCE: IEC 60050-151:2001 [1], 151-16-08]

3.24
rear
part of the *VDIS* supporting wiring which is not accessible during functional operation

3.25
routine test
conformity test made on each individual item during or after manufacture

[SOURCE: IEC 60050-151:2001 [1], 151-16-17]

3.26
single-pole earthed single-phase system
type of single-phase power transmission system, which is earthed on one pole, for example at the secondary transformer output

3.27
socket-outlet
accessory having socket-contacts designed to engage with the pins of a *plug* and having terminals for the connection of cables or cords

[SOURCE IEC 60050-442:1998 [5], 442-03-02]

3.28
testing element
built-in or external device of the *VDIS*, by means of which the functioning of the *indicator* and the built-in power source (if present) can be checked by the user

3.29
testing point
front accessible *socket-outlet* of the *VDIS*, which provides access to the signal

3.30
threshold voltage
U_t
value of the *measuring voltage* corresponding to the change of state from the indication "voltage not present" to the indication "voltage present"

Note 1 to entry: The minimum value of U_t is designated by $U_{t\,min}$ and the maximum by $U_{t\,max}$.

3.31
type test
conformity test made on one or more items representative of the production

[SOURCE: IEC 60050-151:2001 [1], 151-16-16]

3.32
voltage detecting and indicating system
VDIS
device used to detect and indicate the presence or absence of *operating voltage* and to deliver a signal for other functions

Note 1 to entry: The other functions can be, for example, phase comparison or voltage measurement.

3.33
voltage limiting element
element that limits the voltage at *testing points* and *connecting points* if they exist, in case of failure of the *coupling system*

4 Normal and special service conditions

4.1 General

Normal and special service conditions, according to IEC 62271-1:2017, Clause 4, are not applicable in this document and are replaced by the following.

Unless otherwise specified, the *VDIS* is intended to be used in accordance with its rated characteristics and the normal service conditions listed hereafter.

4.2 Normal service conditions

For *VDIS* installed on indoor and outdoor *equipment*, the normal service conditions are as follows:

a) the ambient air temperature is between – 25 °C and + 40 °C;
b) there is no influence from solar radiation;
c) the altitude does not exceed 1 000 m;
d) the average value of the relative humidity, measured over a period of 24 h, does not exceed 95 %;

NOTE Condensation can be expected where sudden temperature changes occur in periods of high humidity.

e) the vibrations due to external causes to the *equipment* on which the *VDIS* is mounted do not exceed vibrations caused by operation of the *equipment* itself;
f) some pollution of the ambient air surrounding the *VDIS*, such as salt mist, can be expected.

4.3 Special service conditions

When special service conditions prevail at the location where the *VDIS* is installed, they should be specified by the user.

For example, for outdoor conditions defined IEC 62271-1:2017, 4.1.3, an additional protection may be provided such as an enclosure.

5 Ratings

The following ratings of the *VDIS* shall be in accordance with the common ratings of switchgear and controlgear given in IEC 62271-1, or other *equipment* on which it is mounted.

– The voltage *rated value* (U_r) of the *VDIS* shall be the same as the rated voltage value of the *equipment* on which it is mounted, and in accordance with IEC 62271-1:2017, 5.2.
– The rated insulation level (U_p, U_d, and U_s where applicable) of the *VDIS* shall be in accordance with IEC 62271-1:2017, 5.3, and shall be the same or higher than the rated insulation level of the *equipment* on which the *VDIS* is fixed.
– The preferred *rated values* of the frequency of the *VDIS* are 16,7 Hz, 25 Hz, 50 Hz, 60 Hz.

In addition, the *nominal voltage*, or *nominal voltage* range ($U_{n\ min}$, $U_{n\ max}$), of the system on which the *VDIS* can be used, shall be defined.