IEC 62271-215

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

High-voltage switchgear and controlgear – Part 215: Phase comparator used with VDIS

Appareillage à haute tension – Partie 215: Comparateur de phase utilisé avec un VDIS

IEC 62271-215:2021-06(en-fr)

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 215: Phase comparator used with VDIS

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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International Standard IEC 62271-215 has been prepared by sub-committee SC17C: Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear in liaison with IEC TC 78: Live working.

This first edition cancels and replaces the first edition of IEC 61243-5 published in 1997 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) the document does not include the specific *phase comparators* (SPCs) as defined in IEC 61243-5, which was specific to manufacturers, and takes back the technical principles of the universal phase comparator (UPC) for *VDIS* of all manufacturers;
b) the phase comparator for sequential connected operation is introduced to facilitate the operation of phase comparation of large MV panels.

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

FDIS	Report on voting
17C/788/FDIS	17C/795/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.

This International Standard is to be used in conjunction with IEC 62271-13:2021.

In this document, the following print types are used:

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

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.

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

INTRODUCTION

This part of IEC 62271 has been prepared based on IEC 62271-1 and is linked to IEC 62271-213 for its functionality.

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.

The principle of phase comparison is compatible with the one developed by IEC TC 78 in the standard IEC 61481-1.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 215: Phase comparator used with VDIS

1 Scope

This part of IEC 62271 is applicable to *phase comparators* designed to be plugged into the *testing points* of a *voltage detecting and indicating system* (*VDIS*) according to IEC 62271-213, to give an indication of the result of a phase comparison.

The main usage is to provide clear evidence of the phase relationship between two energized parts of a high-voltage network, at the same *nominal voltage* and frequency before coupling them.

This document or parts of the document can also be applied to the phase comparison function of other devices connected to the *VDIS* upon agreement between manufacturer and user.

This document does not cover *phase comparators* to be used directly on bare parts of live electrical installation at the *nominal voltage* of the networks. These *phase comparators* are covered by IEC 61481-1 and IEC 61481-2.

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 60068-2-31, *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 60417, *Graphical symbols for use on 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 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

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*

IEC 62271-213, *High-voltage switchgear and controlgear – Part 213: Voltage detecting and indicating system*

3 Terms and definitions

For the purposes of this document, the following terms, definitions and symbols 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
visual (optionally audible) phenomenon, whose presence, absence or variation is considered as representing a specific state, for example the phase comparison result

3.2
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

[SOURCE: IEC 60050-151:2001 [1][1], 151-11-25, modified – the Note is removed.]

3.3
front
part of *VDIS* accessible during functional operation

[SOURCE: IEC 62271-213:2021, 3.9]

3.4
indicator
part of the *phase comparator* which indicates the phase comparison result

3.5
input impedance
X_c
impedance of the input circuit measured between the input terminals of the *phase comparator* 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.

[1] Numbers in square brackets refer to the Bibliography.

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

3.6
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]

3.7
measuring voltage
value of the voltage measured at the *testing point* or the *connecting point* if it exists

[SOURCE: IEC 62271-213, 3.16]

3.8
memory holding time
Δt
maximum available time of the sequential operation *phase comparator* to contact the second part to be compared, after the indication "memory ready" appears when the *phase comparator* is in contact with the first part to be tested

[SOURCE: IEC 61481-1:2014, 3.20, modified – "Δt" added; "for a single-pole phase comparator" removed; "of the sequential operation phase comparator" added.]

3.9
nominal voltage
U_n
value of the voltage by which the electrical installation or part of the electrical installation is designated and identified

[SOURCE: IEC 60050-826:2004 [7], 826-11-01]

3.10
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 [8], 903-01-21]

3.11
phase comparator
diagnostic device used to provide clear evidence of the presence or the absence of the correct phase relationship between two energized parts at the same *nominal voltage* and frequency

[SOURCE: IEC 60050-651:2014 [6], 651-24-03]

3.12
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 [4], 442-03-01]

3.13
probe
input device of a measuring instrument, generally made as a separate unit and connected to it by means of flexible cable, which transmit the measurand in a suitable form.

[SOURCE: IEC 60050-313:2001 [3], 313-09-11]

3.14
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]

3.15
response time
delay between the time when the *phase comparator* makes contact with the second part to be compared and the relevant indication of the result of a phase comparison

3.16
routine test
conformity test made on each individual item during or after manufacture

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

3.17
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 [4], 442-03-02]

3.18
testing element
built-in or external device or procedure, by means of which the functioning of the *indicator* can be checked by the user

3.19
testing point
front accessible *socket outlet* of a *VDIS*, which provides access to the signal

[SOURCE: IEC 62271-213:2021, 3.29]

3.20
threshold parameter
φ_p
phase angle φ_p between two *VDIS testing points* voltage signals which causes a change of the result of the phase comparison

3.21
type test
conformity test made on one or more items representative of the production

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

3.22
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.

[SOURCE: IEC 62271-213:2021, 3.32]

4 Normal and special service conditions

4.1 Normal service conditions

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

Operation under normal service conditions is covered by the *type test*s in accordance with this document.

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 %.

4.2 Special service conditions

Special environmental conditions should be defined by agreement between the end user and the manufacturer of the *phase comparator*.

5 Ratings

The following rating of the *phase comparator* shall be in accordance with the common ratings of the *VDIS* to which it is connected:

– the preferred *rated values* of the frequency of the *phase comparator* are 16,7 Hz, 25 Hz, 50 Hz, 60 Hz.

6 Design and construction

6.1 General

The *phase comparator* is a portable device that shall be plugged into two *VDIS testing points* to perform the phase comparison.

The *phase comparator* shall be designed and constructed according to the following requirements:

6.2 Parts of *phase comparator*

A *phase comparator* shall include:

– an *indicator*;
– *probes*;