IEC 62271-214

Edition 2.0 2024-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

High-voltage switchgear and controlgear – Part 214: Internal arc classification for AC metal-enclosed pole-mounted switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

Appareillage à haute tension – Partie 214 : Classification arc interne des appareillages sous enveloppe métallique à courant alternatif de tensions assignées supérieures à 1 kV et inférieures ou égales à 52 kV montées sur poteau

IEC 62271-214:2024-04(en-fr)

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 214: Internal arc classification for AC metal-enclosed pole-mounted switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

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IEC 62271-214 has been prepared by subcommittee 17C: Assemblies, of IEC technical committee 17: High voltage switchgear and controlgear. It is an International Standard.

This second edition cancels and replaces the first edition published in 2019. This edition constitutes a technical revision.

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

a) indicators positioning update;
b) neutral earthing connection of the test circuit for three-phase tests;
c) general review for consistency with IEC 62271-200, Ed.3.0:2021.

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

Draft	Report on voting
17C/924/FDIS	17C/931/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/publications.

This standard shall be read in conjunction with IEC 62271-1, second edition, published in 2017, to which it refers, and which is applicable unless otherwise specified in this standard. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in IEC 62271-1. Amendments to these clauses and subclauses are given under the same references whilst additional subclauses are numbered from 101. Any clause with the term "Not applicable" relates to the clause not being relevant to IEC 62271-214, and does not infer the clause is or is not relevant for its applicable switchgear standard.

A list of all parts of 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, or
- revised.

INTRODUCTION

IEC 62271-214 has been developed due to the requirement to remove IAC Type C designated pole-mounted switchgear from IEC 62271-200. IEC 62271-214 is to be considered independent of IEC 62271-200, however it is still related to other product standards of the IEC 62271 series.

Only open terminal pole-mounted switchgear and controlgear has been considered within this document.

This equipment relates to operation in three-phase, two-phase and single-phase systems.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 214: Internal arc classification for AC metal-enclosed pole-mounted switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

1 Scope

This part of IEC 62271 specifies requirements for internal arc classification of AC metal-enclosed pole-mounted switchgear and controlgear with rated voltages above 1 kV and up to and including 52 kV with service frequencies up to and including 60 Hz.

This document is applicable to three-phase, two-phase and single-phase open terminal equipment for which an internal arc classification is assigned. Enclosures may include fixed and removable components and may be filled with fluid (liquid or gas) to provide insulation.

NOTE 1 The IAC classification takes into account the installation disposition of the high-voltage switchgear and controlgear and worker's operating area.

NOTE 2 For the use of this document, high-voltage (IEC 60050-601:1985, 601-01-27) is the rated voltage above 1 000 V. However, medium voltage (IEC 60050-601:1985, 601-01-28) is commonly used for distribution systems with voltages above 1 kV and generally applied up to and including 52 kV; refer to [1][1].

This document does not preclude that other equipment may be included in the same enclosure. In such a case, any possible influence of that equipment on the switchgear and controlgear is to be taken into account.

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 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*
IEC 60050-151:2001/AMD1:2013
IEC 60050-151:2001/AMD2:2014
IEC 60050-151:2001/AMD3:2019
IEC 60050-151:2001/AMD4:2020
IEC 60050-151:2001/AMD5:2021

IEC 60050-441:1984, *International Electrotechnical Vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses*
IEC 60050-441:1984/AMD1:2000

IEC 62271-1:2017, *High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear*
IEC 62271-1:2017/AMD1:2021

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

IEC 62271-200:2021, *High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62271-1, IEC 60050-151 and IEC 60050-441, as well as the following apply.

NOTE 1 The classification system for definitions of IEC 62271-1:2017 is not followed. Terms and definitions are referenced and prioritized in the following order:

– Clause 3 of this document;

– IEC 62271-1:2017;

– IEC 60050-441;

– IEC 60050-151.

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

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

NOTE 2 Additional definitions are classified so as to be aligned with the classification system used in IEC 60050-441.

3.1 General terms and definitions

3.1.101
metal-enclosed switchgear and controlgear
switchgear and controlgear assemblies with an external metal enclosure intended to be earthed, and completely assembled except for external connections

[SOURCE: IEC 60050-441:1984, 441-12-04, modified – "complete" has been replaced by "completely assembled"; NOTE has been deleted.]

3.1.102
enclosure
part of an assembly providing a specified degree of protection of equipment against external influences and a specified degree of protection against approach to or contact with live parts and against contact with moving parts

[SOURCE: IEC 60050-441:1984, 441-13-01, modified – <of an assembly> has been deleted.]

3.1.103
high-voltage compartment
compartment of switchgear and controlgear, containing high-voltage conducting parts, enclosed except for openings necessary for interconnection, control or ventilation, where one segment of the compartment can be part of the outer earthed metallic enclosure

3.1.104
component
essential part of the high-voltage or earthing circuits of pole-mounted switchgear and controlgear which serves a specific function (e.g. circuit-breaker, disconnector, switch, fuse, instrument transformer, bushing, busbar)

3.1.105
main circuit
all the high-voltage conductive parts of pole-mounted switchgear and controlgear included in a circuit which is intended to carry the rated continuous current

[SOURCE: IEC 60050-441:1984, 441-13-02, modified – "high voltage" has been added, "assembly" has been substituted by "pole-mounted switchgear and controlgear" and "transmit electrical energy" has been substituted by "carry the rated continuous current".]

3.1.106
earthing circuit
conductors, connections, and the conducting parts of earthing devices intended to connect the high-voltage conductive parts to the earthing system of the installation

Note 1 to entry: Parts of metallic enclosures connected to the earthing system can be part of the earthing circuit.

3.1.107
normal operating condition
in service condition with all covers properly closed and secured

Note 1 to entry: The term "in service" implies "under live conditions".

[SOURCE: IEC 62271-200:2021[2], 3.1.106, modified – "<of an assembly>" and "doors and" have been removed and Note 1 to entry has been added.]

3.1.108
pressure relief device
device incorporated as part of an enclosure or compartment intended to operate to prevent excessive pressure in the enclosure or compartment

3.1.109
fluid-filled compartment
high-voltage compartment of pole-mounted switchgear and controlgear filled with a fluid, either gas, other than ambient air, or liquid, for insulation purposes

3.1.110
pole
vertical single member support in wood, concrete, steel or other material, with one end buried in the ground, either directly or by means of a foundation

Note 1 to entry: The term pole as defined here is not to be mixed up with the use of the same term as synonymous for phase as used in other standards.

[SOURCE: IEC 60050-466:1990, 466-07-01[8], modified – Note 1 to entry has been added.]

3.1.111
pole-mounted switchgear and controlgear
metal-enclosed switchgear and controlgear, typically connected to overhead lines, installed on one or more poles or equivalent structures at a defined height, with restricted accessibility by installation out of reach

3.1.112
internal arc classification
IAC
metal-enclosed switchgear and controlgear for which prescribed criteria, for protection of authorized persons and the general public beneath the apparatus, are met in the event of internal arc for specified installation conditions, as demonstrated by type tests

Note 1 to entry: The internal arc classification is described by the characteristics given from 3.1.114 to 3.1.116.

[SOURCE: IEC 62271-200:2021, 3.6.117, modified – "authorized" and "and general public beneath the apparatus" have been added, "assembly" has been changed by "metal-enclosed switchgear and controlgear".]

3.1.113
arc fault current
three-phase and where applicable the single-phase-to-earth RMS value of the internal arc fault current for which the switchgear and controlgear is designed to protect persons in the event of an internal arc

[SOURCE: IEC 62271-200:2021, 3.7.101]

3.1.114
arc fault duration
duration of the internal arc fault current for which the switchgear and controlgear is designed to protect persons in the event of an internal arc

[SOURCE: IEC 62271-200:2021, 3.7.102]

3.1.115
approach distance
distance between the test object and indicators arranged in an IAC test

3.1.116
arc mitigation device
device dedicated to reacting to internal arc fault conditions to decrease the arc energy

[SOURCE: CIGRE TECHNICAL BROCHURE 686:2017][5]

3.8 Index of definitions

A – C

E – F

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4 Normal and special service conditions

Clause 4 of IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021 is not applicable.

5 Ratings

Subclauses of Clause 5 of IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021 not mentioned below are not applicable for this document.

5.1 General

Subclause 5.1 of IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021 is not applicable and replaced by following text:

The relevant ratings for the internal arc classification are the following:

a) rated voltage (U_r);

b) rated frequency (f_r);

c) ratings of the internal arc classification (IAC).

5.2 Rated voltage (U_r)

Subclause 5.2 of IEC 62271-1:2017 is applicable with following addition to 5.2.1.

5.2.1 General

The rated voltage is equal to the maximum system voltage for which the equipment is designed. It indicates the maximum value of the "highest system voltage" of networks for which the equipment may be used (refer to Clause 9 of IEC 60038:2009 [6]).

NOTE It is possible that components forming part of pole-mounted switchgear and controlgear have differing values of rated voltage in accordance with their relevant standards.

5.3 Rated insulation level (U_d, U_p, U_s)

Not applicable.

5.4 Rated frequency (f_r)

Subclause 5.4 of IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021 is applicable.

5.101 Ratings of the internal arc classification (IAC)

5.101.1 General

An IAC classified pole-mounted switchgear and controlgear shall have the following ratings: rated approach distance, arc fault currents and arc fault durations.

5.101.2 Rated approach distance (D_{AP})

The rated approach distance shall be stated by the manufacturer (refer to Figure 2).

5.101.3 Rated arc fault currents (I_A, I_{Ae})

The value of rated arc fault currents should be selected from the R 10 series specified in IEC 60059 [7].

Two ratings of the arc fault currents are recognised:

a) three-phase and phase-to-phase arc fault current (I_A), when applicable;

b) single-phase-to-earth arc fault current (I_{Ae}), when applicable.

When only a three-phase rating is specified, the single-phase rating is by default 87 % of the three-phase rating, and need not be specified.

NOTE 1 The rationale for this 87 % is the arc fault test with 2-phase ignition; refer to 7.101.7.2.

The manufacturer shall specify the compartments to which the single-phase-to-earth arc fault current rating applies. Such value is assigned to switchgear and controlgear where its construction will prevent the arc from becoming multiphase, as demonstrated during the internal arc test.

In the case where all high-voltage compartments are only designed for single-phase-to-earth arc faults, instead of I_A rating, the I_{Ae} rating shall be assigned (refer to 7.101.7.2).

NOTE 2 Information about the relationship between type of neutral earthing and the single-phase-to-earth arc fault current is provided in 9.101.6.

5.101.4 Rated arc fault duration (t_A, t_{Ae})

Recommended values for the arc fault duration (t_A, t_{Ae}) are 0,1 s, 0,5 s and 1 s.

NOTE It is in general not possible to calculate the permissible arc duration for a current which differs from that used in the test.

6 Design and construction

Subclauses of Clause 6 of IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021 not mentioned below are not applicable for this document.

6.11 Nameplate

6.11.2 Application

Subclause 6.11.2 of IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021 is applicable, except for Table 9, with the following additions: