

TECHNICAL SPECIFICATION



High-voltage switchgear and controlgear –
Part 319: Alternating current circuit-breakers intended for controlled switching

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

**Part 319: Alternating current circuit-breakers
intended for controlled switching**

FOREWORD

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IEC TS 62271-319 has been prepared by subcommittee 17A: Switching devices, of IEC technical committee 17: High-voltage switchgear and controlgear. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
17A/1404/DTS	17A/1411/RVDTS

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 Technical Specification 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 document is to be read in conjunction with IEC 62271-100:2021, to which it refers and which is applicable unless otherwise specified.

A list of all parts of IEC 62271 series, 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

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INTRODUCTION

This part of IEC 62271, which is a Technical Specification, clearly segregates normative requirements which are presented in the main text, from informative and advisory information which is presented in a series of annexes. Using this approach all information pertaining to the topic of circuit-breakers intended for controlled switching can be consolidated into this single reference document. The IEC considers that this approach best meets the market need by presenting all relevant information in the most concise and readily usable form.

For the purposes of this document, it has been assumed that there is no significant interaction between the effects of the various parameters (for example ambient temperature, control voltage, etc.) which are considered to affect the mechanical performance of the circuit-breaker. This has not been proven for all combinations, however service experience with controlled switching suggests this assumption is valid in practice for commonly used drive technologies.

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 319: Alternating current circuit-breakers intended for controlled switching

1 Scope

This part of IEC 62271, which is a Technical Specification, is applicable to alternating current circuit-breakers with intentional non-simultaneous pole operation designed for indoor or outdoor installations and for operation at frequencies of 50 Hz and 60 Hz on systems having voltages above 1 000 V. This document provides additional ratings and type tests to be conducted for this type of circuit-breaker and is intended to be used in conjunction with IEC 62271-100:2021. Intentional non-simultaneous pole operation can be implemented by mechanical or electrical means and both methods are within the scope of this document.

Satisfactory service performance of controlled switching systems is influenced by the inherent performance capabilities of the switching device and by the choice of a suitable controller (relay) and requires proper integration of these devices. Consequently, practical applications of controlled switching require a coordinated approach to system integration.

This document addresses the performance capabilities of the switching device and establishes suitability for controlled switching when applied with an appropriate controller. Type tests are defined, and guidance is provided to establish the switching device capabilities and parameters required to facilitate proper system integration, but this document does not address the performance requirements of the controller. In summary, compliance and testing in accordance with the requirements and guidance presented herein verify the ability of the switching device to meet defined switching accuracy requirements only when applied with a suitably specified controller.

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

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

IEC 62271-100:2021, *High-voltage switchgear and controlgear – Part 100: Alternating-current circuit-breakers*
IEC 62271-100:2021/AMD1:2024

IEC 62271-101:2021, *High-voltage switchgear and controlgear – Part 101: Synthetic testing*

IEC 62271-110, *High-voltage switchgear and controlgear – Part 110: Inductive load switching*

IEC TR 62271-306:2012, *High-voltage switchgear and controlgear – Part 306: Guide to IEC 62271-100, IEC 62271-1 and other IEC standards related to alternating current circuit-breakers*

IEC TR 62271-306:2012/AMD1:2018

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-441 and IEC 62271-100 and the following apply.

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>

3.1 General terms and definitions

3.1.101

idle time

time interval between consecutive operations (either between a close and open or open and close operation)

3.1.102

compensation

predictive correction for changes in operating time taking account of ambient, drive and supply conditions

3.2 Assemblies of switchgear and controlgear

3.2.101

controlled switching system

combination of circuit-breaker, controller and necessary sensors and auxiliary equipment required to achieve controlled switching as defined in 3.6.101

Note 1 to entry: Necessary sensors refers to those required to provide inputs to the controlled system and may include voltage transformers, current transformers, temperature sensors etc.

3.3 Parts of assemblies

No particular definitions.

3.4 Switching devices

No particular definitions.

3.5 Parts of switchgear and controlgear

No particular definitions.

3.6 Operational characteristics of switchgear and controlgear

3.6.101

controlled switching

intended operation of a circuit-breaker at a specific, pre-determined point in relation to the power frequency current or voltage

Note 1 to entry: The terms point-on-wave switching and point-on-cycle switching are also in widespread use to describe controlled switching.

3.6.102**intentional non-simultaneous pole operation**

operation of a circuit-breaker with a specific, pre-determined time delay or delays between the operation of the individual poles

Note 1 to entry: Non-simultaneity is typically measured and expressed in electrical degrees with relation to the phase taken as reference e.g. 0°, 0°, 90° for each pole.

3.6.103**mechanically staggered circuit-breaker**

circuit-breaker with fixed, mechanically implemented, non-simultaneous pole operation

3.6.104**controller**

device used to define the instant of switching of a circuit-breaker and to operate each pole independently according to a predefined sequence

3.7 Characteristic quantities**3.7.101****opening time**

<of a mechanical switching device>

interval of time between the specified instant of initiation of the opening operation and the instant when the arcing contacts have separated in all poles

Note 1 to entry: The instant of initiation of the opening operation, i.e. the application of the opening command (for example energizing the release, etc.) is given in the relevant specification.

Note 2 to entry: Time from the instant of coil energization to arcing contact separation. Any delay introduced by a controller is not considered.

[SOURCE: IEC 60050-441:1984+AMD1:2000, 441-17-36, modified – Notes 1 and 2 to entry added]

3.7.102**closing time**

interval of time between the initiation of the closing operation and the instant when the contacts touch in all poles

Note 1 to entry: Time from the instant of coil energization to arcing contact touch. Any delay introduced by a controller is not considered.

[SOURCE: IEC 60050-441:1984+AMD1:2000, 441-17-41, modified – Note 1 to entry added]

3.7.103**close-open time**

interval of time between the instant when the arcing contacts touch in the first pole during a closing operation and the instant when the arcing contacts have separated in all poles during the subsequent opening operation

[SOURCE: IEC 60050-441:1984+AMD1:2000, 441-17-42, modified – addition of "arcing"]

3.7.104**minimum close-open clearing time**

sum of the minimum close-open time when a trip command comes after a minimum relay time of half a cycle after the arcing contacts touch in the first two poles during a closing operation and the shortest arcing time of a minor loop breaking in the last phase to make

Note 1 to entry: For convenience of testing, the manufacturer may declare that the minimum close-open clearing time is equal to sum of the minimum close-open time and the shortest arcing time of a minor loop breaking in the last phase to make.