IEC 62146-2

Edition 1.0 2023-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Capacitors for high-voltage alternating current circuit-breakers – Part 2: TRV capacitors

Condensateurs pour disjoncteurs à courant alternatif haute tension – Partie 2: Condensateurs TTR



IEC 62146-2:2023-01 (en-fr)



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.060; 31.060.70

ISBN 978-2-8322-6353-2

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CAPACITORS FOR HIGH-VOLTAGE ALTERNATING CURRENT CIRCUIT-BREAKERS –

Part 2: TRV capacitors

FOREWORD

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IEC 62146-2 has been prepared by IEC technical committee 33: Power capacitors and their applications. It is an International Standard.

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

Draft	Report on voting
33/685/FDIS	33/686/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 International Standard is to be used in conjunction with IEC 62146-1:2013 and IEC 62146-1:2013/AMD1:2016.

A list of all parts in the IEC 62146 series, published under the general title *Capacitors for high-voltage alternating current circuit-breakers*, can be found on the IEC website. The title of the series was changed in 2022 by decision of TC 33, and the title of IEC 62146-1 will be modified accordingly in its next edition.

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- withdrawn,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.

CAPACITORS FOR HIGH-VOLTAGE ALTERNATING CURRENT CIRCUIT-BREAKERS –

Part 2: TRV capacitors

1 Scope

This part of IEC 62146 is applicable to TRV capacitors used on high-voltage alternating current circuit-breakers with rated voltages above 100 kV with 50 Hz or 60 Hz.

TRV capacitors are installed phase to earth, either in parallel to the bushing on dead tank circuit-breakers, or immersed inside the circuit-breaker, or freestanding close to the circuit-breaker. Their function is to limit the transient recovery voltage (TRV) and the rate of rise of recovery voltage (RRRV) on the circuit-breaker. Capacitors in compliance with this document can be used as TRV capacitor.

This document applies to TRV capacitors falling into one or both of the following categories for:

– mounting on or close to air insulated switchgear (AIS) dead tank and live tank circuit-breakers, or
– mounting on gas insulated switchgear (GIS) circuit-breakers.

The testing for each of the above applications is in some cases different.

This document does not apply to grading capacitors installed in parallel to the chambers of the circuit-breaker, which are specified in IEC 62146-1.

This document does not apply to capacitors not directly associated with high-voltage alternating current circuit-breakers.

The object of this document is:

– to define uniform rules regarding performances, testing and rating
– to define specific safety rules
– to provide a guidance for installation and operation

The TRV capacitor is a sub-component for the circuit-breaker and is specified in accordance with the circuit-breaker specifications according to IEC 62271-1, IEC 62271-100, and if applicable to IEC 62271-203.

TRV capacitors are commonly built with composite or ceramic housings (insulators). Those insulators follow IEC 61462 or IEC 62155. Other housings can be used if they can sustain applicable type tests according to IEC 61462 and IEC 62155.

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 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60358-1:2012, *Coupling capacitors and capacitor dividers – Part 1: General rules*

IEC 60815 (all parts), *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions*

IEC 60871-1:2014, *Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V – Part 1: General*

IEC 61462:2007, *Composite hollow insulators – Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1 000 V – Definitions, test methods, acceptance criteria and design recommendations*

IEC 62146-1:2013, *Grading capacitors for high-voltage alternating current circuit-breakers – Part 1: General*
IEC 62146-1:2013/AMD1:2016

IEC 62155:2003, *Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1 000 V*

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

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

IEC 62271-203, *High-voltage switchgear and controlgear – Part 203: AC gas-insulated metal-enclosed switchgear for rated voltages above 52 kV*

IEC GUIDE 109, *Environmental aspects – Inclusion in electrotechnical product standards*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62146-1:2013 and the following apply.

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

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

3.1
capacitor
two-terminal device characterized essentially by its capacitance

[SOURCE: IEC 60050-151:2001, 151-13-28]

3.2
TRV capacitor
capacitor for installation on high-voltage circuit-breakers phase to earth, either on circuit-breaker bushings or freestanding close to the circuit-breaker to limit TRV or RRRV

Note 1 to entry: The TRV capacitors alone are accessories of the circuit-breaker.

3.3
freestanding capacitor
TRV capacitor installed as an accessory to the circuit-breaker and mounted in its proximity

Note 1 to entry: The freestading capacitor does not need to be fixed at the same supporting structure of the circuit-breaker.

Note 2 to entry: Freestanding capacitors are sometimes named standalone TRV capacitors.

3.4
ambient temperature
temperature of the insulating fluid surrounding the capacitor at its surface

3.5
transient recovery voltage
TRV
recovery voltage during the time in which it has a significant transient character

Note 1 to entry: The transient recovery voltage may be oscillatory or non-oscillatory or a combination of these depending on the characteristics of the circuit and the switching device. It includes the voltage shift of the neutral of a polyphase circuit.

Note 2 to entry: The transient recovery voltages in three-phase circuits are, unless otherwise stated, that across the first pole to clear, because this voltage is generally higher than that which appears across each of the other two poles.

[SOURCE: IEC 60050-441:1984, 441-17-26]

3.6
rate of rise of recovery voltage
RRRV
first peak transient recovery voltage divided by the total time from zero voltage to peak voltage

Note 1 to entry: Levels of TRV and the RRRV are key factors in determining whether the fault can be cleared successfully.

3.7
voltage factor
F_V
factor used when the TRV capacitor is composed of several capacitors connected in series phase to earth

Note 1 to entry: F_v will affect the insulating voltage levels of the individual capacitors to add some safety margin.

4 Abbreviated terms

Clause 4 of IEC 62146-1:2013 is applicable with the following additions.

F_v	voltage factor
TRV	transient recovery voltage
RRRV	rate of rise of recovery voltage

5 Service conditions

For TRV capacitors installed on the circuit-breaker or immersed capacitors, the service conditions are given in IEC 62146-1:2013, Clause 5.

For freestanding capacitors, the service conditions are given in IEC 60358-1:2012, Clause 4.