SLOVENSKI STANDARD
oSIST prEN IEC 62146-2:2022

01-junij-2022

Kondenzatorji za izravnavo potenciala pri visokonapetostnih odklopnikih za izmenični tok - 2. del: Kondenzatorji TRV

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

Condensateurs de répartition pour disjoncteurs à courant alternatif haute tension - Partie 2: Condensateurs TTR

Ta slovenski standard je istoveten z: **prEN IEC 62146-2:2022**

ICS:

31.060.70 Močnostni kondenzatorji Power capacitors

oSIST prEN IEC 62146-2:2022 **en**

33/673/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

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IEC TC 33 : POWER CAPACITORS AND THEIR APPLICATIONS

SECRETARIAT: Italy	SECRETARY: Mr Stefano Zunino
OF INTEREST TO THE FOLLOWING COMMITTEES: SC 17A	PROPOSED HORIZONTAL STANDARD: ☐
	Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

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

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CAPACITORS FOR HIGH-VOLTAGE ALTERNATING CURRENT CIRCUIT-BREAKERS - PART 2: TRV CAPACITORS

FOREWORD

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International Standard IEC 62146-2 has been prepared by IEC Technical Committee 33: Power capacitors and their applications.

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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 the IEC 62146 series 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 standard can be used as TRV capacitor.

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

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

The object of this standard is:

– to define uniform rules regarding performances, testing and rating

– to define specific safety rules

– to provide a guidance for installation and operation

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

NOTE 2: TRV capacitors are commonly built with composite or ceramic housings (insulators). Those insulators shall 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, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60071-1:2019, *Insulation co-ordination – Part 1: Definitions, principles and rules*

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 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+AMD1:2016, *Grading capacitors for high-voltage alternating current circuit-breakers – Part 1: General*

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 control gear – Part 1: Common specifications for alternating current switchgear and control gear*

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

IEC 62271-203:2011, *High-voltage switchgear and control gear – Part 203: 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 following terms and definitions 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

Clause 3 of IEC 62146-1 is applicable with the following additions:

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: The freestanding TRV capacitors are sometimes named standalone TRV capacitors.

3.4
ambient air temperature
temperature of the air at the proposed location of the capacitor

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, IEC 62271-100:2021]

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: Level 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 Abbreviations

Clause 4 of IEC 62146-1 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 clause 5.

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

6 Ratings

6.1 Rated voltage (U_{cr})

The rated voltage U_{cr} of a TRV capacitor connected between one phase of a three-phase system and earth shall be equal or greater than the value of the rated voltage U_r of the circuit-breaker divided by √3.

Preferred values for U_r are given in IEC 62271-1.

NOTE: U_r used in IEC 62271 series and in this standard corresponds to U_m presented in IEC 60071-1.

6.2 Rated insulation level

The choice of the insulation level for equipment shall be made in accordance with the standard insulation levels, based on its highest voltage for equipment U_r. Guidance for the choice of the insulation level is given below.

In case of TRV capacitor of an air insulated circuit-breaker installed parallel to the bushing, the insulation levels are according to IEC 62271-1.

In case of TRV capacitor installed in a gas insulated switchgear (GIS and dead tank breaker), the insulation levels are according to IEC 62271-203.

In case of TRV capacitor installed freestanding, the insulation levels are according to Table 1 and Table 2 (adapted from IEC 60358-1). The rated insulation levels shall be based on the rated voltage of the circuit-breaker U_r.

Table 1 – Standard insulation levels – Range I (Ur < 300 kV)

Range	Rated voltage of the circuit-breaker (U_r) (r.m.s.) kV	Rated power-frequency withstand voltage (r.m.s.) kV	Rated lightning impulse withstands voltage (peak) kV	Rated switching withstand voltage (peak) kV
I	100	185	450	
	123	185	450	
		230	550	
	145	230	550	
		275	650	
	170	275	650	
		325	750	
	245	395	950	
		460	1050	

NOTE 1: For exposed installations it is recommended to choose the highest insulation level.

NOTE 2: For alternative levels, see IEC 60071-1.

Table 2 – Standard insulation levels – Range II (Ur ≥ 300 kV)

Range	Rated voltage of the circuit-breaker (U_r) (r.m.s.) kV	Rated power-frequency withstand voltage (r.m.s.) kV	Rated lightning impulse withstands voltage (peak) kV	Rated switching withstand voltage (peak) kV
II	300	395	850	750
			950	
		460	950	850
			1050	
	362	460	950	850
			1050	
		510	1050	950
			1175	
	420	570	1050	850
			1175	
			1175	950
			1300	
		630	1300	1050
			1425	
	550	630	1175	950
			1300	
			1300	1050