

Series capacitors for power systems - Part 4: Thyristor
controlled series capacitors

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>See Eesti standard EVS-EN IEC 60143-4:2024 sisaldab Euroopa standardi EN IEC 60143-4:2024 ingliskeelset teksti.</p> <p>Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 26.01.2024.</p> <p>Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.</p>	<p>This Estonian standard EVS-EN IEC 60143-4:2024 consists of the English text of the European standard EN IEC 60143-4:2024.</p> <p>This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.</p> <p>Date of Availability of the European standard is 26.01.2024.</p> <p>The standard is available from the Estonian Centre for Standardisation and Accreditation.</p>
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English Version

Series capacitors for power systems - Part 4: Thyristor controlled
series capacitors
(IEC 60143-4:2023)

Condensateurs série destinés à être installés sur des
réseaux - Partie 4: Condensateurs série commandés par
thyristors
(IEC 60143-4:2023)

Reihenkondensatoren für Starkstromanlagen - Teil 4:
Thyristorgesteuerte Reihenkondensatoren
(IEC 60143-4:2023)

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European foreword

The text of document 33/696/FDIS, future edition 2 of IEC 60143-4, prepared by IEC/TC 33 "Power capacitors and their applications" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60143-4:2024.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2024-10-18
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This document is read in conjunction with EN 60143-1:2015, EN 60143-2:2013 and EN 60143-3:2015.

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The text of the International Standard IEC 60143-4:2023 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60060-2 NOTE Approved as EN 60060-2

IEC 60068-1 NOTE Approved as EN 60068-1

IEC 60068-3-3 NOTE Approved as EN IEC 60068-3-3

IEC 60721-1 NOTE Approved as EN 60721-1

IEC 61000-4-2 NOTE Approved as EN 61000-4-2

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Series capacitors for power systems –
Part 4: Thyristor controlled series capacitors**

**Condensateurs série destinés à être installés sur des réseaux –
Partie 4: Condensateurs série commandés par thyristors**



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INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Series capacitors for power systems –
Part 4: Thyristor controlled series capacitors**

**Condensateurs série destinés à être installés sur des réseaux –
Partie 4: Condensateurs série commandés par thyristors**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SERIES CAPACITORS FOR POWER SYSTEMS –**Part 4: Thyristor controlled series capacitors**

FOREWORD

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IEC 60143-4 has been prepared by IEC technical committee 33: Power capacitors and their applications. It is an International Standard.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

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

- a) thyristor valve testing requirements refer to IEC 62823;
- b) Formula (1) in Subclause 4.2 has been corrected;
- c) Hardware-in-the-loop (HIL) tests, Subclause 7.5.4, replaces previously specified real time protection and control system test with network simulator.

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

Draft	Report on voting
33/696/FDIS	33/702/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 part of IEC 60143 is to be used in conjunction with the following standards:

- IEC 60143-1:2015,
- IEC 60143-2:2012,
- IEC 60143-3:2015.

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.

A list of all parts of IEC 60143 series, under the general title *Series capacitors for power systems*, can be found on the iec website.

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SERIES CAPACITORS FOR POWER SYSTEMS –

Part 4: Thyristor controlled series capacitors

1 Scope

This part of IEC 60143 specifies the testing of thyristor controlled series capacitor (TCSC) installations used in series with transmission lines. This document also addresses issues that consider ratings for TCSC thyristor valve assemblies, capacitors, and reactors as well as TCSC control characteristics, protective features, cooling system and system operation.

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.

NOTE If there is a conflict between this part of IEC 60143 and a standard listed below in Clause 2, this document prevails.

IEC 60050-436, *International Electrotechnical Vocabulary (IEV) – Part 436: Power capacitors*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Tests B: Dry heat*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60076-1, *Power transformers – Part 1: General*

IEC 60076-6:2007, *Power transformers – Part 6: Reactors*

IEC 60143-1:2015, *Series capacitors for power systems – Part 1: General*

IEC 60143-2:2012, *Series capacitors for power systems – Part 2: Protective equipment for series capacitor banks*

IEC 60143-3:2015, *Series capacitors for power systems – Part 3: Internal fuses*

IEC 60255-21 (all parts), *Electrical relays – Vibration, shock, bump and seismic tests on measuring relays and protection equipment*

IEC 60255-27, *Measuring relays and protection equipment – Part 27: Product safety requirements*

IEC 61000-4 (all parts), *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61000-4-29, *Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input port immunity tests*

IEC 62823:2015, *Thyristor valves for thyristor controlled series capacitors (TCSC) – Electrical testing*

IEC 62823:2015/AMD1:2019

NOTE Additional useful references, not explicitly referenced in the text, are listed in the Bibliography.

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC 60143-1, IEC 60143-2, IEC 60143-3, some taken from IEC 60050-436, 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>

NOTE In some instances, the IEC definitions can be either too broad or too restrictive. In such a case, an additional definition or note has been included.

3.1 Terms and definitions

3.1.1

thyristor valve

electrically combined assembly of thyristor levels, complete with all connections, auxiliary components and mechanical structures, which can be connected in series with each phase of the reactor or capacitor of a TCSC

3.1.2

bypass current

current flowing through the bypass switch, protective device, thyristor valve, or other devices, in parallel with the series capacitor, when the series capacitor is bypassed

3.1.3

temporary overload

short duration (typically 30 min) overload capability of the TCSC at rated frequency and ambient temperature range

SEE: Figure 5 and Figure 10.

3.1.4

dynamic overload

short duration (typically 10 s) overload capability of the TCSC at rated frequency and ambient temperature range

SEE: Figure 5 and Figure 10.

3.1.5

thyristor-controlled series capacitor

TCSC

assembly of thyristor valves, TCSC reactor(s), capacitors, and associated auxiliaries, such as structures, support insulators, switches, and protective devices, with control equipment required for a complete operating installation