Irish Standard
I.S. EN 60143-2:2013

Series capacitors for power systems -- Part 2: Protective equipment for series capacitor banks (IEC 60143-2:2012 (EQV))

I.S. EN 60143-2:2013

Incorporating amendments/corrigenda issued since publication:

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I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces:	*This document is based on:*	*Published:*
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EN 60143-2

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Supersedes EN 60143-2:1994

English version

Series capacitors for power systems - Part 2: Protective equipment for series capacitor banks

(IEC 60143-2:2012)

Condensateurs série destinés à être installés sur des réseaux - Partie 2: Matériel de protection pour les batteries de condensateurs série (CEI 60143-2:2012)

Reihenkondensatoren für Starkstromanlagen - Teil 2: Schutzeinrichtungen für Reihenkondensatorbatterien (IEC 60143-2:2012)

This European Standard was approved by CENELEC on 2013-01-15. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 60143-2:2013 E

Foreword

The text of document 33/517/FDIS, future edition 2 of IEC 60143-2, prepared by IEC/TC 33 "Power capacitors and their applications" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60143-2:2013.

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)	2013-12-14
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-01-15

This document supersedes EN 60143-2:1994.

EN 60143-2:2013 includes the following significant technical changes with respect to EN 60143-2:1994:

- updated with respect to new and revised component standards;
- updates with respect to technology changes. Outdated technologies have been removed, i.e. series capacitors with dual self-triggered gaps. New technologies have been added, i.e. current sensors instead of current transformers;
- the testing of spark gaps has been updated to more clearly specify requirements and testing procedures. A new bypass making current test replaces the old discharge current test;
- Clause 5, Guide, has been expanded with more information about different damping circuits and series capacitor protections.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

Endorsement notice

The text of the International Standard IEC 60143-2:2012 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 standards indicated:

IEC 60068-1	NOTE	Harmonised as EN 60068-1.
IEC 60068-2-2	NOTE	Harmonised as EN 60068-2-2.
IEC 60068-2-78	NOTE	Harmonised as EN 60068-2-78.
IEC 60068-2-30	NOTE	Harmonised as EN 60068-2-30.
IEC 60071-1	NOTE	Harmonised as EN 60071-1.
IEC 60071-2	NOTE	Harmonised as EN 60071-2.
IEC 60143-3	NOTE	Harmonised as EN 60143-3.
IEC 60255-1	NOTE	Harmonised as EN 60255-1.
IEC 60383-1	NOTE	Harmonised as EN 60383-1.

IEC 60383-2	NOTE	Harmonised as EN 60383-2.
IEC 60507	NOTE	Harmonised as EN 60507.
IEC 60549	NOTE	Harmonised as EN 60549.
IEC 60654-1	NOTE	Harmonised as EN 60654-1.
IEC 60654-4	NOTE	Harmonised as EN 60654-4.
IEC 60871-1	NOTE	Harmonised as EN 60871-1.
IEC 60909 Series	NOTE	Harmonised as EN 60909 Series (not modified).
IEC 61000-4-2	NOTE	Harmonised as EN 61000-4-2.
IEC 61000-4-11	NOTE	Harmonised as EN 61000-4-11.
IEC 62217	NOTE	Harmonised as EN 62217.
IEC 62271-100	NOTE	Harmonised as EN 62271-100.
IEC 62223	NOTE	Harmonised as EN 62223.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60044	Series	Instrument transformers	EN 60044	Series
IEC 60044-1	-	Instrument transformers - Part 1: Current transformers	EN 60044-1	-
IEC 60044-8	-	Instrument transformers - Part 8: Electronic current transformers	EN 60044-8	-
IEC 60060	Series	High-voltage test techniques	EN 60060	Series
IEC 60076-1	-	Power transformers - Part 1: General	EN 60076-1	-
IEC 60076-6	2007	Power transformers - Part 6: Reactors	EN 60076-6	2008
IEC 60099-4 (mod) + A1 + A2	2004 2006 2009	Surge arresters - Part 4: Metal-oxide surge arresters without gaps for a.c. systems	EN 60099-4 +A1 +A2	2004 2006 2009
IEC 60143-1	2004	Series capacitors for power systems - Part 1: General	EN 60143-1	2004
IEC 60255-5	-	Electrical relays - Part 5: Insulation coordination for measuring relays and protection equipment - Requirements and tests	EN 60255-5	-
IEC 60255-21-1	-	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section 1: Vibration tests (sinusoidal)	EN 60255-21-1	-
IEC 60270	-	High-voltage test techniques - Partial discharge measurements	EN 60270	-
IEC 60358-1	-	Coupling capacitors and capacitor dividers - Part 1: General rules	EN 60358-1	-
IEC 60358-2	-	Coupling capacitors and capacitor dividers - Part 2: AC or DC single-phase coupling capacitor connected between line and ground for power line carrier-frequency (PLC) application	EN 60358-2	-
IEC 60794-1-1	-	Optical fibre cables - Part 1-1: Generic specification - General	EN 60794-1-1	-
IEC 60794-2	-	Optical fibre cables - Part 2: Indoor cables - Sectional specification	EN 60794-2	-

Publication	Year	Title	EN/HD	Year
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 power port immunity tests	EN 61000-4-29	-
IEC 61109	-	Insulators for overhead lines - Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V - Definitions, test methods and acceptance criteria	EN 61109	-
IEC 61300-3-4	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-4: Examinations and measurements - Attenuation	EN 61300-3-4	-
IEC 61869-3	-	Instrument transformers - Part 3: Additional requirements for inductive voltage transformers	EN 61869-3	-
IEC 61869-5	-	Instrument transformers - Part 5: Additional Requirements for capacitor voltage transformers	EN 61869-5	-
IEC 62271-1	-	High-voltage switchgear and controlgear - Part 1: Common specifications	EN 62271-1	-
IEC 62271-102 + corr. April + corr. May + corr. February	2001 2002 2003 2005	High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches	EN 62271-102 + corr. March + corr. July	2002 2005 2008
IEC 62271-109	2008	High-voltage switchgear and controlgear - Part 109: Alternating-current series capacitor by-pass switches	EN 62271-109	2009

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SERIES CAPACITORS FOR POWER SYSTEMS –

Part 2: Protective equipment for series capacitor banks

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60143-2 has been prepared by IEC technical committee 33: Power capacitors and their applications.

This second edition cancels and replaces the first edition published in 1994. It constitutes a technical revision. The main changes with respect to the previous edition are:

- updated with respect to new and revised component standards;
- updates with respect to technology changes. Outdated technologies have been removed, i.e. series capacitors with dual self-triggered gaps. New technologies have been added, i.e. current sensors instead of current transformers;
- the testing of spark gaps has been updated to more clearly specify requirements and testing procedures. A new bypass making current test replaces the old discharge current test;
- Clause 5, Guide, has been expanded with more information about different damping circuits and series capacitor protections

The text of this standard is based on the following documents:

FDIS	Report on voting
33/517/FDIS	33/521/RVD

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

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

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

SERIES CAPACITORS FOR POWER SYSTEMS –

Part 2: Protective equipment for series capacitor banks

1 Scope

This part of IEC 60143 covers protective equipment for series capacitor banks, with a size larger than 10 Mvar per phase. Protective equipment is defined as the main circuit apparatus and ancillary equipment, which are part of a series capacitor installation, but which are external to the capacitor part itself. The recommendations for the capacitor part are given in IEC 60143-1:2004. The protective equipment is mentioned in Clause 3 and 10.6 of IEC 60143-1:2004.

The protective equipment, treated in this standard, comprises the following items listed below:

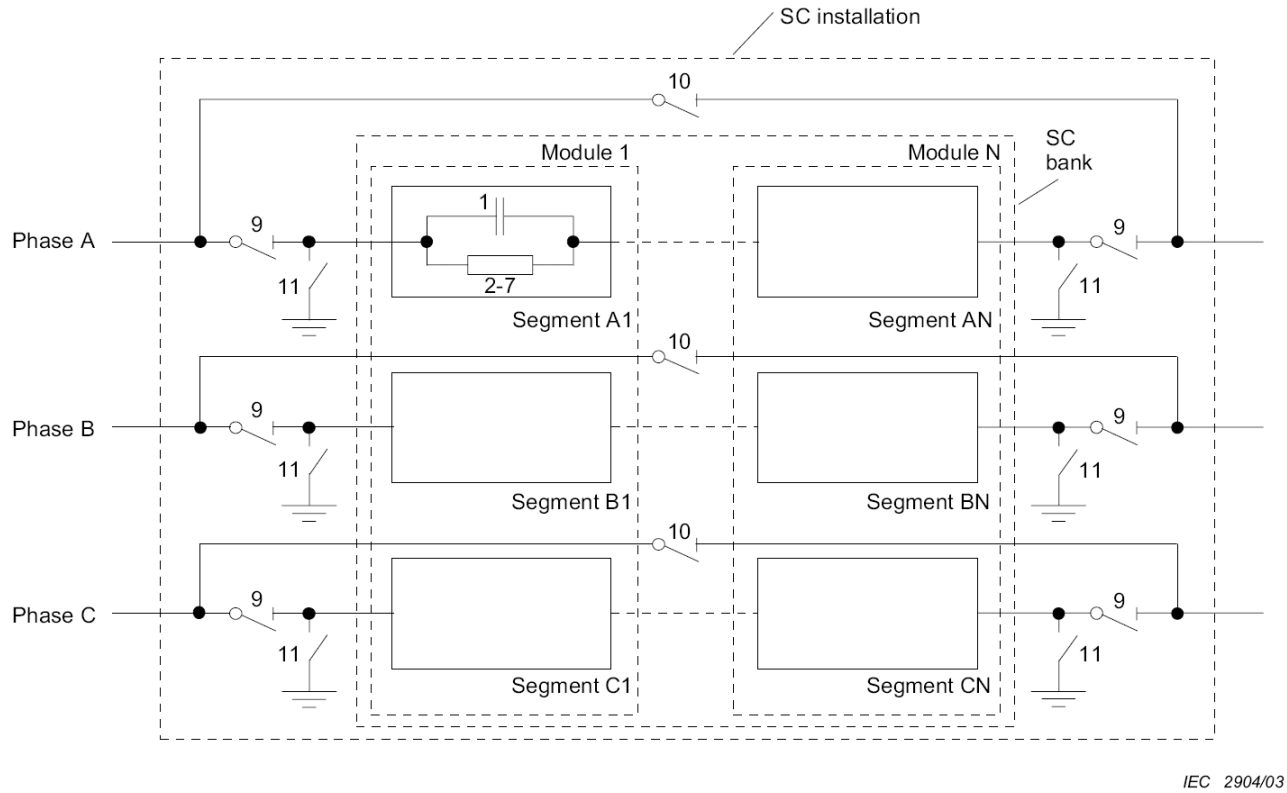
– overvoltage protector,
– protective spark gap,
– varistor,
– bypass switch,
– disconnectors and earthing switches,
– discharge current-limiting and damping equipment,
– voltage transformer,
– current sensors,
– coupling capacitor,
– signal column,
– fibre optical platform links,
– relay protection, control equipment and platform-to-ground communication equipment.

See Figure 1.

Principles involved in the application and operation of series capacitors are given in Clause 5.

Examples of fault scenarios are given in Clause 5.

Examples of protective schemes utilizing different overvoltage protectors are given in 4.1.



Key

1 assembly of capacitor units

2-7 main protective equipment

9 isolating disconnector

10 bypass disconnector

11 earth switch

Figure 1 – Typical nomenclature of a series capacitor installation

NOTE Most series capacitors are configured with a single module, unless the reactance and current requirements result in a voltage across the bank that is impractical for the supplier to achieve with one module. Normally each module has its own bypass switch but a common bypass switch can be used for more than one module. See 10.2.3 of IEC 60143-1:2004 for additional details.

The object of this standard is:

– to formulate uniform rules regarding performance, testing and rating,

– to illustrate different kinds of overvoltage protectors,

– to provide a guide for installation and operation.

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 60044 (all parts), *Instrument transformers*

IEC 60044-1, *Instrument transformers – Part 1: Current transformers*

IEC 60044-8, *Instrument transformers – Part 8: Electronic current transformers*