

SLOVENSKI STANDARD
SIST EN IEC 61954:2022**01-marec-2022****Nadomešča:****SIST EN 61954:2011****SIST EN 61954:2011/A1:2016****SIST EN 61954:2011/A2:2018**

Statični kompenzatorji jalove energije (var) - Preskušanje tiristorskih ventilov (IEC 61954:2021)

Static var compensators (SVC) - Testing of thyristor valves (IEC 61954:2021)

Statische Blindleistungskompensatoren (SVC) - Prüfung von Thyristorventilen (IEC 61954:2021)

Compensateurs statiques de puissance réactive (SVC) - Essais des valves à thyristors (IEC 61954:2021)

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29.240.99	Druga oprema v zvezi z omrežji za prenos in distribucijo električne energije	Other equipment related to power transmission and distribution networks
31.080.20	Tiristorji	Thyristors

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EUROPEAN STANDARD

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NORME EUROPÉENNE

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Static VAR compensators (SVC) - Testing of thyristor valves (IEC 61954:2021)

Compensateurs statiques de puissance réactive (SVC) -
Essais des valves à thyristors
(IEC 61954:2021)

Statische Blindleistungskompensatoren (SVC) - Prüfung
von Thyristorventilen
(IEC 61954:2021)

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 61954:2021 (E)**European foreword**

The text of document 22F/642/FDIS, future edition 3 of IEC 61954, prepared by SC 22F “Power electronics for electrical transmission and distribution systems” of IEC/TC 22 “Power electronic systems and equipment” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61954:2021.

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) 2022-08-08
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-11-08

This document supersedes EN 61954:2011 and all of its amendments and corrigenda (if any).

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60060	series	High-voltage test techniques	EN 60060	series
IEC 60060-1	2010	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	2010
IEC 60060-2	-	High-voltage test techniques - Part 2: Measuring systems	EN 60060-2	-
IEC 60071	series	Insulation co-ordination	EN IEC 60071	series
IEC 60071-1	2019	Insulation co-ordination - Part 1: Definitions, principles and rules	EN IEC 60071-1	2019
IEC 60270	-	High-voltage test techniques - Partial discharge measurements	EN 60270	-
IEC 60700-1	2015	Thyristor valves for high voltage direct current (HVDC) power transmission - Part 1: Electrical testing	EN 60700-1	2015

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Edition 3.0 2021-10

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Static VAR compensators (SVC) – Testing of thyristor valves

Compensateurs statiques de puissance réactive (SVC) – Essais des valves à thyristors

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**STATIC VAR COMPENSATORS (SVC) –
TESTING OF THYRISTOR VALVES**

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 61954 has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment.

This third edition cancels and replaces the second edition published in 2011, Amendment 1:2013 and Amendment 2:2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: important clarifications were made in 4.4.1.2, 5.1.2.2, 5.1.3.2, 5.2.3.2, 6.1.2.2, 6.1.2.4, 6.1.3.2, 6.2.2.2, 6.2.2.4, 6.3.2.2 and 9.3.2.

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

FDIS	Report on voting
22F/642/FDIS	22F/658/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.

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/standardsdev/publications.

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.

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STATIC VAR COMPENSATORS (SVC) – TESTING OF THYRISTOR VALVES

1 Scope

This document defines type, production and optional tests on thyristor valves used in thyristor controlled reactors (TCR), thyristor switched reactors (TSR) and thyristor switched capacitors (TSC) forming part of static VAR compensators (SVC) for power system applications. The requirements of the document apply both to single valve units (one phase) and to multiple valve units (several phases).

Clauses 4 to 7 detail the type tests, i.e. tests which are carried out to verify that the valve design meets the requirements specified. Clause 8 covers the production tests, i.e. tests which are carried out to verify proper manufacturing. Clauses 9 and 10 detail optional tests, i.e. tests additional to the type and production tests.

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 (all parts), *High-voltage test techniques*

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

IEC 60060-2, *High-voltage test techniques – Part 2: Measuring systems*

IEC 60071 (all parts), *Insulation co-ordination*

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

IEC 60270, *High-voltage test techniques – Partial discharge measurements*

IEC 60700-1:2015, *Thyristor valves for high-voltage direct current (HVDC) power transmission – Part 1: Electrical testing*

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>

3.1**thyristor level**

part of a thyristor valve comprising a thyristor, or thyristors connected in parallel or anti-parallel, together with their immediate auxiliaries and reactor, if any

3.2**thyristor (series) string**

series connected thyristors forming one direction of a thyristor valve

3.3**valve reactor**

reactor incorporated within some valves for limitation of stresses

Note 1 to entry: For testing purposes it is considered an integral part of the valve.

3.4**valve section**

electrical assembly, comprising a number of thyristors and other components, which exhibits pro-rated electrical properties of a complete thyristor valve, but only a portion of the full voltage blocking capability of the thyristor valve, and which can be used for tests

3.5**thyristor valve**

electrically and mechanically 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 an SVC

3.6**valve structure**

physical structure which insulates the valves to the appropriate level above earth potential and from each other

3.7**valve base electronics****VBE**

electronic unit, at earth potential, which is the interface between the control system of the SVC and the thyristor valves

3.8**multiple valve unit****MVU**

assembly of several valves in the same physical structure which cannot be separated for test purposes (e.g. three-phase valves)

3.9**redundant thyristor levels**

maximum number of thyristor levels in the thyristor valve that may be short-circuited, externally or internally, during service without affecting the safe operation of the thyristor valve as demonstrated by type tests; and which if and when exceeded, would require either the shutdown of the thyristor valve to replace the failed thyristors, or the acceptance of increased risk of failures

3.10**voltage breakover (VBO) protection**

means of protecting the thyristors from excessive voltage by firing them at a predetermined voltage

4 General requirements for type, production and optional tests

4.1 Summary of tests

Table 1 lists the tests given in the following clauses and subclauses.

Table 1 – List of tests

Test	Subclause		Test object
	TCR/TSR	TSC	
Dielectric tests between valve terminals and earth (type tests)			
AC test	5.1.2		Valve
AC-DC test		6.1.2	Valve
Lightning impulse test	5.1.3	6.1.3	Valve
Dielectric tests between valves (MVU only) (type tests)			
AC test	5.2.2		MVU
AC-DC test		6.2.2	MVU
Lightning impulse test	5.2.3	6.2.3	MVU
Dielectric tests between valve terminals (type tests)			
AC test	5.3.2		Valve
AC-DC test		6.3.2	Valve
Switching impulse test	5.3.3	6.3.3	Valve
Operational tests (type tests)			
Periodic firing and extinction test	5.4.1		Valve or valve section
Overcurrent test		6.4.1	Valve or valve section
Minimum AC voltage test	5.4.2	6.4.2	Valve or valve section
Temperature rise test	5.4.3	6.4.3	Valve or valve section
Electromagnetic interference tests (type tests)			
Switching impulse test	7.2.2	7.2.2	Valve
Non-periodic firing test	7.2.3	7.2.3	Valve
Production tests			
Visual inspection	8.2	8.2	
Connection check	8.3	8.3	
Voltage dividing/damping circuit check	8.4	8.4	
Voltage withstand check	8.5	8.5	
Check of auxiliaries	8.6	8.6	
Firing check	8.7	8.7	
Cooling system pressure test	8.8	8.8	
Partial discharge tests	8.9	8.9	
Optional tests			
Overcurrent test	9.1		Valve or valve section
Positive voltage transient during recovery test	9.2	10.1	Valve or valve section
Non-periodic firing test	9.3	10.2	Valve or valve section