SLOVENSKI STANDARD
SIST EN 60700-1:2001

01-junij-2001

Tiristorski ventili (elektronke) za visokonapetostni enosmerni prenos (HVDC) elektriļ ne energije - 1. del: Elektriļ no preskuġanje (IEC 60700-1:1998)

Thyristor valves for high voltage direct current (HVDC) power transmission -- Part 1: Electrical testing

Thyristorventile für Hochspannungsgleichstrom-Energieübertragung (HGÜ) -- Teil 1: Elektrische Prüfung

Valves à thyristors pour le transport d'énergie en courant continu à haute tension (CCHT) -- Partie 1: Essais électriques

Ta slovenski standard je istoveten z: **EN 60700-1:1998**

ICS:

29.200	Usmerniki. Pretvorniki. Stabilizirano elektriļ no napajanje	Rectifiers. Convertors. Stabilized power supply
31.080.20	Tiristorji	Thyristors

SIST EN 60700-1:2001 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60700-1

October 1998

ICS 29.200

Descriptors: Electric power transmission, direct current, high voltage equipment, switchgear semiconductor valves, thyristors, electrical tests

English version

Thyristor valves for high voltage direct current (HVDC) power transmission
Part 1: Electrical testing
(IEC 60700-1:1998)

Valves à thyristors pour le transport d'énergie en courant continu à haute tension (CCHT)
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(CEI 60700-1:1998)

Thyristorventile für Hochspannungs-gleichstrom-Energieübertragung
Teil 1: Elektrische Prüfung
(IEC 60700-1:1998)

This European Standard was approved by CENELEC on 1998-10-01. 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.

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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 Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 22F/44/FDIS, future edition 1 of IEC 60700-1, prepared by SC 22F, Power electronics for electrical transmission and distribution systems, of IEC TC 22, Power electronics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60700-1 on 1998-10-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-07-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A, B and ZA are normative and annex C is informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60700-1:1998 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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
ISO/IEC Guide 25	1990	General requirements for the competence of calibration and testing laboratories	-	-
IEC 60060	series	High-voltage test techniques	HD 588.1 S1 EN 60060-2	1991 1994
IEC 60071-1	1993	Insulation co-ordination Part 1: Definitions, principles and rules	EN 60071-1	1995
IEC 60099	series	Surge arresters	EN 60099	series
IEC 60270	1981	Partial discharge measurements	-	-
IEC 61803	-[1)]	Determination of power losses in high-voltage direct current (HVDC) converter stations	-	-

1) To be published.

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
60700-1

Première édition
First edition
1998-09

Valves à thyristors pour le transport d'énergie en courant continu à haute tension (CCHT) –

Partie 1: Essais électriques

Thyristor valves for high voltage direct current (HVDC) power transmission –

Part 1: Electrical testing

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE X

Pour prix, voir catalogue en vigueur
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

THYRISTOR VALVES FOR HIGH VOLTAGE DIRECT CURRENT (HVDC) POWER TRANSMISSION –

Part 1: Electrical testing

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

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6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60700-1 has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronics.

This part of IEC 60700 cancels and replaces IEC 60700, published in 1981, and constitutes a technical revision.

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

FDIS	Report on voting
22F/44/FDIS	22F/46/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.

Annexes A and B form an integral part of this standard.

Annex C is for information only.

THYRISTOR VALVES FOR HIGH VOLTAGE DIRECT CURRENT (HVDC) POWER TRANSMISSION –

Part 1: Electrical testing

1 Scope

This standard applies to thyristor valves with metal oxide surge arresters directly connected between the valve terminals, for use in a line commutated converter for high voltage d.c. power transmission or as part of a back-to-back link. It is restricted to electrical type and production tests.

The tests specified in this standard are based on air insulated valves. For other types of valves, the test requirements and acceptance criteria must be agreed.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60700. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60700 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC Guide 25:1990, *General requirements for the competence of calibration and testing laboratories*

IEC 60060, *High-voltage test techniques*

IEC 60060-1:1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60071-1:1993, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60099, *Surge arresters*

IEC 60270:1981, *Partial discharge measurements*

IEC 61803,— *Determination of power losses in high-voltage direct current (HVDC) converter stations* [1)]

3 Definitions

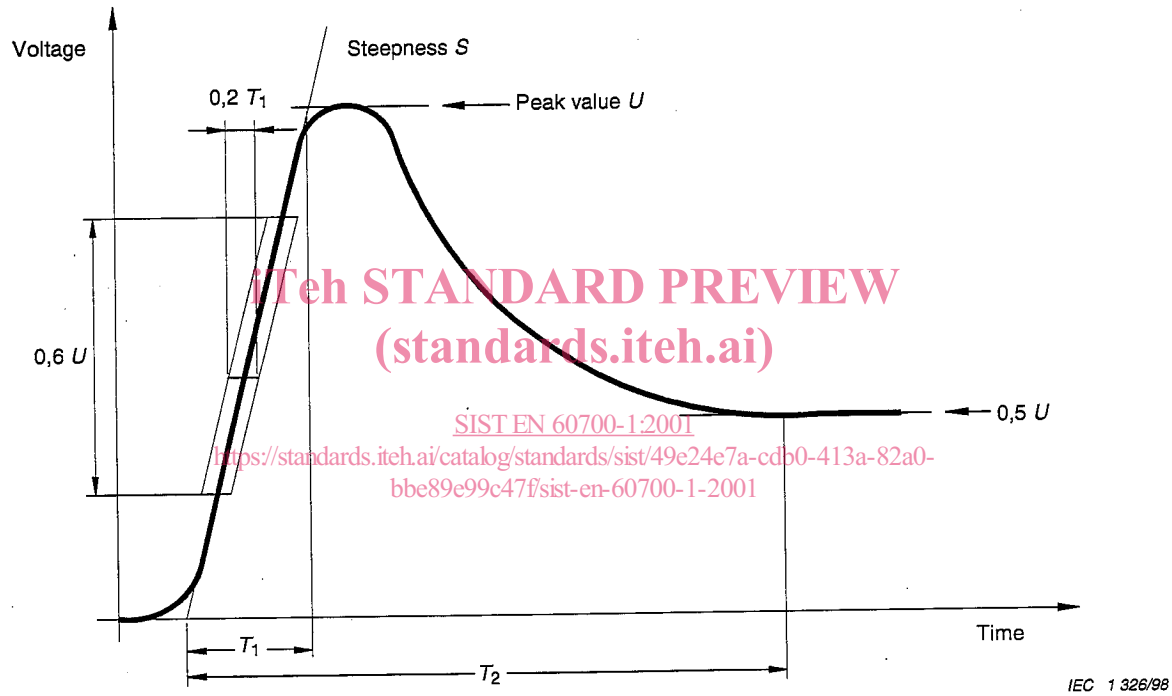
For the purpose of this part of IEC 60700, the following definitions apply.

[1)] To be published.

3.1 Insulation co-ordination terms

3.1.1
test withstand voltage
value of a test voltage of standard waveshape at which a new valve, with unimpaired integrity, does not show any disruptive discharge and meets all other acceptance criteria specified for the particular test, when subjected to a specified number of applications or a specified duration of the test voltage, under specified conditions

3.1.2
steep front impulse
fast-front voltage impulse whose time to peak is less than that of a standard lightning impulse but not less than that of a very-fast-front voltage as defined in IEC 60071-1. For this standard, a steep front impulse voltage for test purposes is defined by figure 1.



NOTES

U = Specified peak value of steep front impulse test voltage (kV)

S = Specified steepness of steep front impulse test voltage (kV/µs)

T_1 = Virtual front time = $\frac{U}{S}$ (µs)

The following conditions shall be satisfied:

a) The peak value of the recorded test voltage shall be $U \pm 3$ %. This tolerance is the same as that in IEC 60060 for standard lightning impulse.

b) Over a voltage excursion of not less than 0,6 U, the rising portion of the recorded test voltage shall be entirely contained between two parallel lines of steepness S and separation 0,2 T_1.

c) The value of the test voltage at T_2 shall not be lower than 0,5 U. T_2 is defined as the time interval between the origin and the instant when the voltage has decreased to half the peak value of the waveform which is obtained from system study. However, it shall be assured that an unintentional dv/dt switching of the thyristors can be adequately detected.

Figure 1 – Steep front impulse test voltage

3.1.3
internal and external insulation
air external to the components and insulating materials of the valve, but contained within the profile of the valve or multiple valve unit is considered as part of the internal insulation system of the valve. The external insulation is the air between the external surface of the valve or multiple valve unit and its surroundings.

3.1.4
valve protective firing
means of protecting the thyristors from excessive voltage by firing them at a predetermined voltage

3.2 Valve construction terms

3.2.1
valve support
that part of the valve which mechanically supports and electrically insulates from earth the active part of the valve which houses the valve sections

NOTE – A part of a valve which is clearly identifiable in a discrete form to be a valve support may not exist in all designs of valves.

3.2.2
valve structure
physical structure holding the thyristor levels of a valve which is insulated to the appropriate voltage above earth potential

3.2.3
redundant thyristor levels
thyristor levels in the series string which may be short circuited, while the specified type test performance of the valve is still met

3.2.4
valve base electronics
electronic unit, at earth potential, which is the interface between the control system for the converter and the thyristor valves

3.3 Type tests

Those tests which are carried out to verify that the valve design will meet the requirements specified. In this standard, type tests are classified under two major categories: dielectric tests and operational tests.

3.3.1
dielectric tests
those tests which are carried out to verify the high voltage characteristics of the valve

3.3.2
operational tests
those tests which are carried out to verify the turn-on, turn-off and current related characteristics of the valve

3.4 Production tests

Those tests which are carried out to verify proper manufacture, so that the properties of a valve correspond to those specified.

3.4.1
routine tests
those production tests which are carried out on all valves, valve sections or components

3.4.2
sample tests
those production tests which are carried out on a small number of valves, valve sections or components taken at random from a batch

4 General requirements

4.1 Guidelines for the performance of type tests

4.1.1 Evidence in lieu

Each design of valve shall be subjected to the type tests specified in this standard. If the valve is demonstrably similar to one previously tested, the supplier may, in lieu of performing a type test, submit a test report of a previous type test for consideration by the purchaser. This should be accompanied by a separate report detailing the differences in the design and demonstrating how the referenced type test satisfies the test objectives for the proposed design.

4.1.2 Test object

a) Certain type tests may be performed either on a complete valve or on valve sections, as indicated in table 2. For those type tests on valve sections, the total number of valve sections tested shall be at least as many as the number in a complete valve.

b) The same valve sections shall be used for all type tests unless otherwise stated.

c) Prior to commencement of type tests, the valve, valve sections and/or the components of them should be demonstrated to have withstood the production tests to ensure proper manufacture.

4.1.3 Sequence of tests

The type tests specified can be carried out in any order.

NOTE – Tests involving partial discharge measurement may provide added confidence if performed at the end of the dielectric type test programme.

4.1.4 Test procedures

The tests shall be performed in accordance with IEC 60060, where applicable.

4.1.5 Ambient temperature for testing

The tests shall be performed at the prevailing ambient temperature of the test facility, unless otherwise specified.

4.1.6 Frequency for testing

AC dielectric tests can be performed at either 50 Hz or 60 Hz. For operational tests, specific requirements regarding the frequency for testing are given in the relevant clauses.