SLOVENSKI STANDARD
SIST EN 61975:2010

01-november-2010

Visokonapetostne enosmerne inštalacije (HVDC) - Sistemski preskusi (IEC 61975:2010)

High-voltage direct current (HVDC) installations - System tests (IEC 61975:2010)

Anlagen zur Hochspannungsgleichstromübertragung (HGÜ) - Systemprüfungen (IEC 61975:2010)

Installations en courant continu à haute tension (CCHT) - Essais système (CEI 61975:2010)

Ta slovenski standard je istoveten z: **EN 61975:2010**

ICS:

29.130.10	Visokonapetostne stikalne in krmilne naprave	High voltage switchgear and controlgear

SIST EN 61975:2010 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

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September 2010

ICS 29.130.10; 31.080.01

English version

High-voltage direct current (HVDC) installations - System tests
(IEC 61975:2010)

Installations en courant continu à haute tension (CCHT) - Essais système
(CEI 61975:2010)

Anlagen zur Hochspannungsgleichstromübertragung (HGÜ) - Systemprüfungen
(IEC 61975:2010)

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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

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Foreword

The text of document 22F/221/FDIS, future edition 1 of IEC 61975, 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 was approved by CENELEC as EN 61975 on 2010-09-01.

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

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)	2011-06-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2013-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61975:2010 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/TR 60919-1	NOTE	Harmonized as CLC/TR 60919-1.
IEC 61000-4-3	NOTE	Harmonized as EN 61000-4-3.
IEC 61803	NOTE	Harmonized as EN 61803.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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 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 60633	1998	Terminology for high-voltage direct current (HVDC) transmission	EN 60633	1999
IEC/TR 60919-2	2008	Performance of high-voltage direct current (HVDC) systems with line-commutated converters - Part 2: Faults and switching	CLC/TR 60919-2	201X[1)]

[1)] At draft stage.

IEC 61975

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INTERNATIONAL STANDARD

High-voltage direct current (HVDC) installations – System tests

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE DIRECT CURRENT (HVDC) INSTALLATIONS – SYSTEM TESTS

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 61975 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 first version of IEC 61975 cancels and replaces IEC/PAS 61975 published jointly in 2004 by IEC and CIGRÉ. It constitutes a technical revision incorporating engineering experience.

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

FDIS	Report on voting
22F/221/FDIS	22F/227/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.

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.

A bilingual version may be issued at a later date.

INTRODUCTION

The standard is structured in eight clauses:

a) Clause 1 – Scope

b) Clause 2 – Normative references

c) Clause 3 – Definitions

d) Clause 4 – General

e) This clause addresses the purpose of this standard, the HVDC system structure, the control and protection structure, the logical steps of commissioning, the structure of the system test and that of the system commissioning standard.

f) Clause 5 – Converter station test

g) This clause addresses the commissioning of converter units and verifies the steady state performance of units as well as switching tests.

h) Clause 6 – Power transmission tests

i) This clause concerns the commissioning of the transmission system, and verifies station coordination, steady-state and dynamic performance, interference, as well as interaction between the d.c. and a.c. systems.

j) Clause 7 – Trial operation

k) After completion of the system test, the period of trial operation is normally specified to verify the normal transmission.

l) Clause 8 – System test plan and documentation

Clauses 5 to 7 comprise individual sections providing an introduction and covering objects, preconditions and procedures and general acceptance criteria as well as detailed descriptions of the individual tests.

HIGH-VOLTAGE DIRECT CURRENT (HVDC) INSTALLATIONS – SYSTEM TESTS

1 Scope

This International Standard applies to system tests for high-voltage direct current (HVDC) installations which consist of a sending terminal and a receiving terminal, each connected to an a.c. system.

The tests specified in this standard are based on bidirectional and bipolar high-voltage direct current (HVDC) installations which consist of a sending terminal and a receiving terminal, each connected to an a.c. system. The test requirements and acceptance criteria should be agreed for back-to-back installations, while multi-terminal systems and voltage sourced converters are not included in this standard. For monopolar HVDC installations, the standard applies except for bipolar tests.

For the special functions or performances that are claimed by specific projects, some extra test items not included in this standard should be added according to the technical specification requirements.

This standard only serves as a guideline to system tests for high-voltage direct current (HVDC) installations. The standard gives potential users guidance, regarding how to plan commissioning activities. The tests described in the guide may not be applicable to all projects, but represent a range of possible tests which should be considered.

Therefore, it is preferable that the project organization establishes the individual test program based on this standard and in advance assigns responsibilities for various tasks/tests between involved organisations (e.g. user, supplier, manufacturer, operator, purchaser etc.) for each specific project.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For updated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60633:1998, *Terminology for high-voltage direct current (HVDC) power transmission*

IEC/TR 60919-2:2008, *Performance of high-voltage direct current (HVDC) systems with line commutated converters – Part 2: Faults and switching*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60633 as well as the following terms and definitions apply.

3.1 Test classifications terms

3.1.1
station test
converter system test including items which verify the function of individual equipment of the converter staton in energized state

3.1.2
system test
test verifying functions and performances of HVDC system as a whole as well as the interaction with adjacent a.c. systems

3.1.3
transmission tests
test verifying functions and performances of HVDC system when transmitting power between both terminals

NOTE It is also referred to as an “end to end test”.

3.2 Operation state terms

In the d.c. system, there are 5 defined states: earthed, stopped, standby, blocked, de-blocked.

3.2.1
earthed
state in which the pole or converter is isolated and earthed on the a.c. and d.c. sides and no energizing of the pole or converter equipment is possible

NOTE The earthed state provides the necessary safety for carrying out maintenance work, and is the only one that permits the pole or converter maintenance. In this state maintenance work is possible on the converter transformers, the isolated and earthed part of the a.c. high voltage bus equipment, d.c. and valve hall installed equipment of this pole or converter.

3.2.2
stopped/isolated
state in which the pole or converter is isolated from the a.c. and d.c. side, but all the earthing switches are open

NOTE In this state the d.c. yard can be prepared for power transmission (earth electrode line, pole and d.c. line connect).

3.2.3
standby
state which is to be used when the d.c. system is not being utilized but is ready for power transmission

NOTE In this state the converter transformer is to be ready; tap-changer is automatically brought to the start position, which ensures that the transformer will be energized with minimum voltage to minimize the inrush current. The disconnector of the a.c. bay should be closed, but the circuit breakers in the feeding bay of the converter transformer should be open. In this state the d.c. configuration can still be changed (earth electrode line, pole and d.c. line connect).

3.2.4
blocked
state in which the pole is prepared to transmit power at a moment’s notice

NOTE The converter transformer is connected to the energized a.c. bus by means of closing of the respective circuit breaker. The valve cooling system is ready for operation if the cooling water conductivity, flow and temperature are within the specified limits. A defined d.c. configuration shall have been established. Further changes are not possible in this state. The thyristor pre-check is carried out after the converter transformer has been energized. The pre-check is considered as passed when in every valve the redundancy is not lost. To change the blocked state, the states stopped, standby and de-blocked are selectable.

3.2.5
de-blocked
state representing the following two operating modes: power transmission and open line test

NOTE Power transmission is the normal operating mode. In the de-blocked status the pole transmits power in normal operating mode if both terminals are in the deblocked stage and there is a voltage difference between the terminals. A minimum number of a.c. filters should be available.

3.2.6
off-site tests
tests which are performed before on-site testing

4 General

4.1 Purpose

System test completes the commissioning of an HVDC system.

The supplier can verify the suitability of the station equipment installed and the functional completeness of the system. Moreover, adjustments and optimizations can be made.

It is shown for the user that the requirements and stipulations in the contract are met and that there is correlation with studies and previous off-site tests.

For the user, the completion of system test marks the beginning of commercial operation of the HVDC system.

When adapting the HVDC system to the connected a.c. systems, there may be various constraints which require coordination within the economic schedules of the a.c. system operators. System tests prove to the public that tolerable values of phenomena concerning the public interest are not exceeded.

Five major aspects are subject to system tests:

a) HVDC station equipment and d.c. line/cable/bus including earth electrode, if any;
b) HVDC control and protection equipment and their settings;
c) environmental considerations;
d) a.c./d.c. system interaction;
e) system performance when jointly operated with a connected a.c. system.

The interrelation between these aspects is shown in Figure 1.