

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

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

Installations en courant continu à haute tension (CCHT) – Essais systèmes

[IEC 61975:2010/AMD2:2022](https://standards.iteh.ai/catalog/standards/sist/776fbd3-3bb2-427f-aa6c-e66df2e09b06/iec-61975-2010-amd2-2022)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

AMENDMENT 2

FOREWORD

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Amendment 2 to IEC 61975:2010 has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment.

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

Draft	Report on voting
22F/670/CDV	22F/691/RVC

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 Amendment 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/.

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- withdrawn,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

2 Normative references

Replace the existing reference to IEC 60633 with the following new reference:

IEC 60633:2019, *High-voltage direct current (HVDC) transmission – Vocabulary*

4.6.1 Factory system test

Add, in the first sentence of the existing last paragraph, the words "and protection" after "control".

4.6.2 Additional simulation test

Replace, in the existing first paragraph, modified by IEC 61975:2010/AMD1:2016, the words "the additional simulation test shall be conducted, if specified by the user" with "any additional simulation tests shall be conducted, if agreed upon between supplier and user".

Add, in item c) of the existing last paragraph, the words "and protection" after "control".

Figure 4 – Structure of system test

Delete, in the second bulleted list item of number 8) in the existing "Power transmission test" section, the word "end".

Replace the existing third bulleted list item of number 8) in the existing Power transmission test section, with the following new items:

- Overload conditions
- Rated load temperature rise

5.2.3.1 Low voltage energization

Replace, in the existing list, item b) with the following new item:

- b) The test may be performed by applying 0,5 kV to 10 kV.

Replace, in the existing note, the words "An alternative approach" with "The preferred approach".

5.2.3.2 High voltage energization

Replace, in the existing list, item c) with the following new item:

- c) Keep the transformer energized for a minimum number of hours as specified by the manufacturer and the local utilities.

5.5.3.2 Test procedure by emitting source

Replace, in the existing list, item b), modified by IEC 61975:2010/AMD1:2016, with the following new item:

- b) Verify that the doors of the control and protection cubicles are closed.

5.5.4 Test acceptance criteria

Add, in the existing text, the words "and protection" after "control".

5.6.1 General

Add, in the existing text, modified by IEC 61975:2010/AMD1:2016, the word "converter" before "transformers".

5.7.3.1 Open line test of the DC switchyard

Delete, in the existing list, items a), f), modified by IEC 61975:2010/AMD1:2016, and g).

6.1.1.2 General precondition

Replace, in item i) of the existing list, modified by IEC 61975:2010/AMD1:2016, the words "All control protection" with "All the control and protection system".

6.1.2.4 Test procedure

Add, in the last sentence of item b) of the existing list, modified by IEC 61975:2010/AMD1:2016, the abbreviated term "AC" before "voltage".

Replace, in the existing list, item h), modified by IEC 61975:2010/AMD1:2016, with the following new item:

- h) Remain at minimum power for as long as needed to complete necessary verification of measurements.

6.1.5.4 Test procedure

Add, at the end of the introduction sentence to the existing list, the words "at both rectifier and inverter side".

Replace the existing list, modified by IEC 61975:2010/AMD1:2016, with the following new list:

- a) Set tap changer control in manual control mode and raise two steps in rectifier side.
- b) Verify that the firing angle increases and the transmitted current is maintained.
- c) Set the tap changer control back to auto control mode.
- d) Verify that the tap changer automatically decreases, firing angle is back within control limits and the transmitted DC current is maintained.
- e) Set tap changer control in manual control mode and decrease two steps in inverter side.
- f) Verify that the tap changer automatically decreases, DC voltage or extinction angle changes based on the inverter control logic.
- g) Set the tap changer control back to auto control mode.

- h) Verify that the tap changer automatically increases, DC voltage or extinction angle return to normal operation value based on the inverter control logic.

6.1.5.5 Test acceptance criteria

Replace the existing text with the following new text:

At all times, AC and DC currents and voltages shall be stable and remain within specified limits. The firing angle and the transformer tap changer shall operate correctly and shall be kept within specified limits.

6.2.1.2 General precondition

Replace, in item i) of the existing list, modified by IEC 61975:2010/AMD1:2016, the words "all control protection" with "all the control and protection system".

6.2.3.2 Purpose of test

Replace the existing text, modified by IEC 61975:2010/AMD1:2016, with the following new text:

Verify the transfer performance of different DC power control modes, including transfer between pole current control, pole power control and bipolar power control.

6.2.3.4 Test procedure

Replace, in the existing list, item a), modified by IEC 61975:2010/AMD1:2016, with the following new item:

- a) At HVDC transmission at minimum power, the operator transfers the DC power control mode subsequently from pole current to pole power, and if applicable to bipolar power and vice versa, at control center of master station.

Delete, in the existing list, item c).

6.2.4.2 Purpose of test

Add, at the end of the first sentence of 6.2.4.2, the words "at different operating points over the full operating range".

Delete the second sentence, added by IEC 61975:2010/AMD1:2016, of 6.2.4.2.

6.2.4.4 Test procedure

Delete, in the existing list, item j), modified by IEC 61975:2010/AMD1:2016.

6.2.5.2 Purpose of test

Add, at the end of the first sentence of the existing paragraph, modified by IEC 61975:2010/AMD1:2016, the words "in different AC and DC system configurations".

Delete the second sentence, added by IEC 61975:2010/AMD1:2016, of the existing paragraph.

6.2.5.4 Test procedure

Replace, in the existing list, items a), e) and f) with the following new items:

- a) Start the HVDC transmission at minimum current or minimum power with rated voltage in the preselected control mode.
- e) Repeat the test at a high current or power level.
- f) Repeat the test in different control modes if applicable.

6.3.2.2.2 Bipolar operation

Add, after item c) of the existing list, the following new item:

- d) De-block the non-operating pole at nominal current.

6.4.2.3 Test precondition

Replace, in the existing list, item b) with the following new item:

- b) All protection functions including commutation failure detection should be in service.

6.4.3.3 Test precondition

Replace, in the existing list, item b) with the following new item:

- b) All protection functions including commutation failure detection should be in service.

6.4.4.2 Purpose of test

Replace, in the existing list, item b), modified by IEC 61975:2010/AMD1:2016, with the following new item:

- b) Verify the performance of switching of DC filters.

6.5.2.1 General

Add, in the second sentence of the existing fourth paragraph, modified by IEC 61975:2010/AMD1:2016, the word "for" after "are."

6.5.4.5 Test acceptance criteria

Delete, in the existing list, in the second sentence of item c), modified by IEC 61975:2010/AMD1:2016, the word "no" before "DC".

6.5.5.2 Purpose of test

Replace the existing sentence with the following new text:

Purposes of the test are the following.

- a) To check the interaction of the HVDC system with the AC system.
- b) To verify that the result of on-site tests is similar to that of simulated off-site tests. If there is any deviation, explanation should be given.

6.6.1.5.4 AC busbar phase-to-earth fault

Replace, in the existing list, item a) with the following new item:

- a) It has the same objective as 6.6.1.5.2 for the close phase-to-earth fault.

6.6.1.5.5 DC line fault

Add, in the existing list, after item d), modified by IEC 61975:2010/AMD1:2016, the following new item:

- e) It checks the accuracy of line fault locator equipment.

6.7.2.4 Test procedure – Test acceptance criteria

Replace, in the first sentence of the existing first paragraph, modified by IEC 61975:2010/AMD1:2016, the words "and at full load" with " and at a load level mutually agreed upon with the utilities".

6.8.3.1 General

Replace, in the second sentence of the existing paragraph, modified by IEC 61975:2010/AMD1:2016, the words "(AC/DC filter, shunt reactor, DC smoothing reactor)" with "(AC filter, shunt reactor – if part of RPC elements)".

6.8.3.3 Test precondition

Delete, in item c) of the existing list, modified by IEC 61975:2010/AMD1:2016, the words "and DC".

Delete, in item f) of the existing list, modified by IEC 61975:2010/AMD1:2016, the words "and DC".

6.8.3.5 Test acceptance criteria

Delete, in item c) of the existing list, modified by IEC 61975:2010/AMD1:2016, the words "and DC".

6.9.4.4 Test procedure

Replace, in the existing sentence under item a), the words "within and adjacent to" with "along".

7.5 Test acceptance criteria

Replace, in the existing list, item a) with the following new item:

- a) During trial operation, no forced outages or disturbances of DC power transmission due to malfunction of any HVDC equipment shall occur.

Add, in the existing list, at the end of the last sentence of item b), the words "according to the contractual agreements".

Replace, in the existing list, item c) with the following new item:

- c) Test acceptance criteria for trial operation should be according to contractual agreements. Including actions in response to unexpected events.

Add, after item c) of the existing list, the following new item d):

- d) Switchover between redundant systems, based on the design concept of the HVDC, is not treated as a malfunction and does not lead to a fail of trial operation.

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**INSTALLATIONS EN COURANT CONTINU À HAUTE
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Le texte de cet Amendement est issu des documents suivants:

Projet	Rapport de vote
22F/670/CDV	22F/691/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.