SLOVENSKI STANDARD
SIST EN 61975:2010/oprA2:2022

01-marec-2022

Visokonapetostne enosmerne inštalacije (HVDC) - Sistemski preskusi - Dopolnilo A2

Amendment 2 - High-voltage direct current (HVDC) installations - System tests

Anlagen zur Hochspannungsgleichstromübertragung (HGÜ) - Systemprüfungen

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

Ta slovenski standard je istoveten z: **EN 61975:2010/prA2:2022**

ICS:

29.130.10	Visokonapetostne stikalne in krmilne naprave	High voltage switchgear and controlgear

SIST EN 61975:2010/oprA2:2022 **en,fr,de**

22F/670/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
IEC 61975/AMD2 ED1	
DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
2022-01-07	**2022-04-01**
SUPERSEDES DOCUMENTS:	
22F/638/CD, 22F/665A/CC	

IEC SC 22F : POWER ELECTRONICS FOR ELECTRICAL TRANSMISSION AND DISTRIBUTION SYSTEMS	
SECRETARIAT: Russian Federation	SECRETARY: Mr Lev Travin
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 115	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING **Attention IEC-CENELEC parallel voting** The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Amendment 2 - High-voltage direct current (HVDC) installations - System tests

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

As the plenary meeting of SC 22F was cancelled in 2020 due to COVID-19 pandemic (see 22F/591/INF), the decision to begin the review of IEC 61975 AMD1 ED1 by SC 22F/MT 27 in 2021 was proposed by SC 22F secretariat and was supported by 100% voting of SC 22F P-members (see 22F/599/DC, 22F/609/INF).

It was noted that the Swedish IEC National Committee made 150 (!) comments on document 22F/638/CD but most of them referred to the basic document IEC 61975 ED1.1 but not to the Amendment 1.

Compilation of comments 22F/665A/CC on document 22F/638/CD was considered by the secretary of SC 22F, the Chair of SC 22F, Convenor and members of SC22F/MT27. It was decided to take into account only comments referred to Amendment 1 as the rest ones could be used only for the revision of IS 61975 but not for its review.

The Chair of SC 22F made decision (supported by the secretary of SC 22F) to prepare a CDV by putting agreed changes into 22F/638/CD by 2021-12.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

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

AMENDMENT 2

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.

2) The formal decisions or agreements of 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 IEC National Committees.

3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

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

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/XX/FDIS	22F/XX/RVD

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/.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

2 Normative references

In the second paragraph, replace:

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

by:

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

4.6.1 Factory system test

In the last paragraph, replace:

"Finding and correcting hardware and software errors in the control system is an important function of the off-site test."

by:

"Finding and correcting hardware and software errors in the control and protection system is an important function of the off-site test."

4.6.2 Additional simulation test

In the first paragraph, replace:

"…the additional simulation test shall be conducted, if specified by the user."

by:

"…any additional simulation tests shall be conducted, if agreed upon between supplier and user."

In the last paragraph, replace:

"c) find and correct hardware and software errors in the control system which are easier to find and correct…"

by:

"c) find and correct hardware and software errors in the control and protection system which are easier to find and correct…"

Figure 4 – Structure of system test

In the paragraph "Power transmission test" item "8) Steady state performance", replace:

"• Reactive power control end performance" *by* "• Reactive power control performance"

and replace:

"Overload/Temperature rise"

by

"• Overload Conditions
• Rated Load Temperature rise"

5.2.3.1 Low voltage energization

In the third paragraph, replace "b) The test may be performed by applying 0,5 to 10 kV…" *by* "b) The test may be performed by applying 0,5 to 10 kV.

Transform Note into the following text:

"The preferred approach to verify the phasing of the converter main circuit connections and the interconnections to the converter transformers is a thorough visual inspection of the interconnection scheme and comparison with the relevant documentation. This will however include verification that the control sends out a firing pulse to the correct thyristor."

5.2.3.2 High voltage energization

In clause c), replace the text:

"Keep the transformer energized for a minimum of 6 h."

by

"Keep the transformer energized for a minimum number of hours as specified by the manufacturer."

5.5.3.2 Test procedure by emitting source

In the third paragraph, replace:

*"*b) Verify that the door of the DC control cubicles is closed.*"*

by:

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

5.5.4 Test acceptance criteria

Replace the existing text by "There shall be no abnormal control and protection actions during the test."

5.6.1 General

Replace the existing text:

*"*The test should be conducted for each trip coil in the converter station and each pole before energizing of the AC filters and transformers.*"*

by:

*"*The test should be conducted for each trip coil in the converter station and each pole before energizing of the AC filters and converter transformers.*"*

5.7.3.1 Open line test of the DC switchyard

*Delete "*a) Connect the neutral side of the converter to earth or to the earth electrode (if available).*" as it is presented* in clause (g) of 5.7.2.2.

*Delete "*f) Repeat the open line test of the DC switchyard with the appropriate DC filters connected one by one and then together.*" as it is not required to have this open converter test done with and without DC Filters*

*Delete "*g) If there are multiple valve groups in each pole they should be initially energized individually and then together."

Modify the serial number of other clauses in order in 5.7.3.1.

6.1.1.2 General precondition

Replace clause i):

"All control protection, metering, sequence of events and fault recording systems shall have been checked and in service."

by:

"All the control and protection system, metering, sequence of events and fault recording systems shall have been checked and in service."

6.1.2.4 Test procedure

Replace clause b): "…voltage can be applied to the converter of each terminal" *by* "…AC voltage can be applied to the converter of each terminal*"*

Change h) *to read:*
*"*h) Remain at minimum power for as long as needed to complete necessary verification of measurements."

6.1.4.4 Test procedure

Replace clause b): "…This procedure should be repeated until the current has reached 0,3 pu.*" by "*…This procedure should be repeated until the current has reached 0,3 pu.*"*

6.1.5.4 Test procedure

Delete the content of clause 6.1.5.4 and add the following content into it:

"The tap changer control test shall be performed either in monopolar metallic or earth return configuration for each pole at both rectifier and inverter side.
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 by:

"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 clause i): "*All control protection…*" by "*All the control and protection system…*"*

6.2.3.2 Purpose of test

Replace the existing text by:

"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 clause a) to d) by:

"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.
b) With the inter-station telecommunication out of service, repeat the tests a) at each station independently.
c) At high power level, repeat test a) and b) again, if applicable."

6.2.4.2 Purpose of test

Replace the existing text by:

"Verify the function of the reactive power control modes and the performance of transfer in-between them at different operating points over the full operating range."

6.2.4.4 Test procedure

*Remove clause j): "*Repeat the tests with DC power in current control mode.**"**

6.2.5.2 Purpose of test

Replace the existing text by:

"Verify the function of the rated and reduced voltage operation mode and the performance of transfer between them in different AC and DC system configurations."

6.2.5.4 Test procedure

Replace clauses a), e) & f) by:

"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."

6.3.1.1 General features

In the last paragraph, replace: "…refer to 4.5 of IEC/TR 60919-2:2008*" by "*…refer to 4.5 of IEC/TR 60919-2:2020*"*

6.3.1.5 Test acceptance criteria

Replace the serial number of the two clauses "c)… d)…" by "a)… b)…".

6.3.2.2.2 Bipolar operation

Replace the content by:

"a) Operate at nominal power.
b) Close the MRTB.
c) Open the ERTB
d) De-block the non-operating pole at nominal current.
e) Verify the current balance in both poles."

6.4.1.1 General features

In the second paragraph, replace "Regarding denomination of switches and their function, refer to IEC/TR 60919-2:2008" *by* "Regarding denomination of switches and their function, refer to IEC/TR 60919-2:2020".