

TECHNICAL REPORT

RAPPORT TECHNIQUE

AMENDMENT 1
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Performance of high-voltage direct current (HVDC) systems with line-commutated converters –
Part 2: Faults and switching

Fonctionnement des systèmes à courant continu haute tension (CCHT) munis
de convertisseurs commutés par le réseau –
Partie 2: Défauts et manoeuvres





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FOREWORD

This amendment 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:

| DTR | Report on voting |
|-------------|------------------|
| 22F/344/DTR | 22F/345A/RVC |

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The French version of this amendment has not been voted upon.

The committee has decided that the contents of this amendment and the base 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- withdrawn,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.

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2 Normative references

Replace the existing reference to “IEC TR 60919-1:2005” by the following new reference:

IEC TR 60919-1:2010, *Performance of high-voltage direct current (HVDC) systems with line-commutated converters – Part 1: Steady-state conditions*
Amendment 1:2013

Replace the existing words “IEC 60919-3” by “IEC TR 60919-3:2009”.

4.2 Energization and de-energization of a.c. side equipment

Replace the second existing sentence of the eighth paragraph by the following new sentence:

When disconnecting a converter transformer from the a.c. network, the transformer should be disconnected maintaining the a.c. filters connected in parallel if possible, instead of disconnecting the transformer alone or by using synchronizing devices.

Delete, in the ninth paragraph of this subclause, the sentence starting with “Some breakers ...”.

5.3.2 Power transfer during faults

Replace, in the fourth paragraph of this subclause, the existing words “reactive control” by “reactive power control”.

5.3.6 Switching of reactive power equipment

Delete the fourth existing paragraph of this subclause.

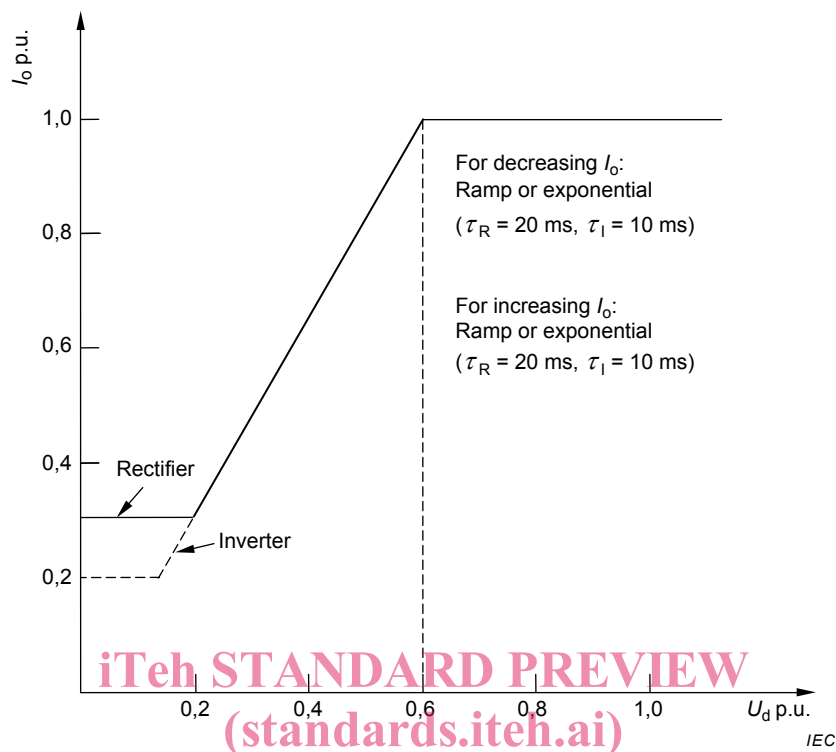
5.3.7 Effects of harmonic voltages and current during faults

Add, at the end of the fourth paragraph of this subclause, the following new sentences:

In this case that digital type relays were used, misoperation could be prevented for some degree of harmonic component. However, it should be taken into account that existing relays of old type do not have immunity to harmonics.

Figure 2 – Example of voltage dependent control characteristics

Replace the existing figure and key by the following new figure and new key:



| | |
|-----------------------|---|
| Key | https://standards.iteh.ai/catalog/standards/sist/e91dac76-9b78-4977-9501-931f692d37a0/iec-tr-60919-2-2008-amd1-2015 |
| U_d | d.c. voltage |
| I_o | current order |
| τ_R and τ_I | rectifier and inverter time constants, respectively |

Figure 2 – Example of voltage dependent control characteristics

6.1 General

Delete, in the existing second paragraph of this subclause, the word “only”.

6.2 Transient overvoltages in filter banks

Replace, in the last existing paragraph of this subclause, the word “ifa” by “if”.

7.1 General

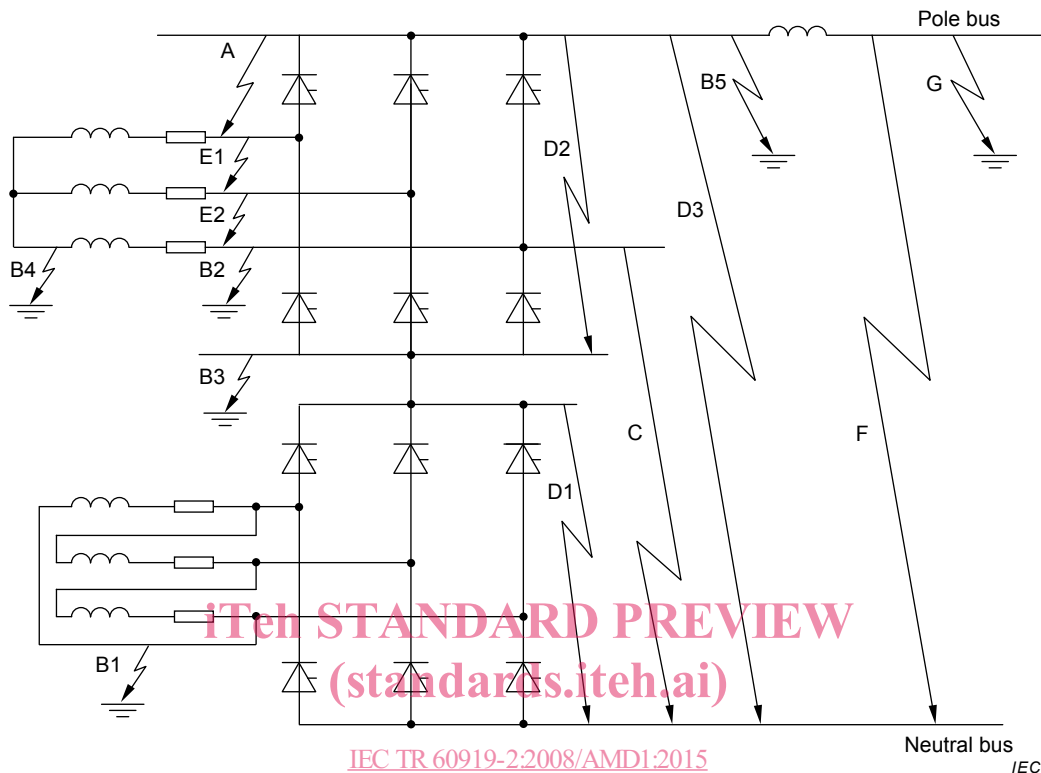
Replace, in the first existing paragraph of this subclause, the words “line side” by “valve side”.

7.2 Short circuits

Delete, in the first line of the tenth paragraph, the existing words “and B5”.

Figure 7 – Examples of a.c. phase short circuits, pole short circuits and faults in a twelve-pulse converter unit

Replace the existing figure by the following new figure (without modifying the key):



9.5.1 Overhead line faults

Add, at the end of the first paragraph of this subclause, the following new sentence:

Figure 15b shows earth current flowing during pole conductor fault to earth.

Figure 15b – Main conductor fault to earth

Replace, in the existing title and key of this figure, the word “Main” by the word “Pole”.

11.3 Fault detection – Metallic return

Replace, in the second line of the third paragraph, the words “Figure 15” by “Figure 15a”.

Replace, in the third line of the third paragraph, the words “Figure 15” by “Figure 15b”.

Add, at the end of the existing fourth paragraph of this subclause, the following new sentence:

For example, 125 Hz for 50 Hz system and 150 Hz for 60 Hz system can be used.

11.4 Metallic return fault protection systems

Replace, in the existing third paragraph of this subclause, “MRTB” by “MRTB or NBGS”.

Add, at the end of the third paragraph of this subclause, the following new sentence:

After the arc quenching, the d.c. circuit-breaker is opened in order to restore d.c. current flowing from earth to metallic conductor.

12.2 Protection schemes using surge arresters

Replace, in the existing first paragraph of this subclause, the words “a arrester” by “an arrester”.

Replace, in the second paragraph of this subclause, the word “are” by “is”.

Replace, in the third paragraph of this subclause, the word “will” by “may”.

12.4 Switching overvoltages and temporary overvoltages on the d.c. side

Replace, at the beginning of the first paragraph of this subclause, the words “Except for” by “Besides”.

12.5 Lightning and steep fronted surges

Replace, in the fourth paragraph of this subclause, the words “should be determined” by “can be determined”.

12.7.1 AC bus arresters (A_1 , A_2 and A_3)

Replace, in the existing subclause, the words “will be installed” by “may be installed”.

Bibliography

Add to the existing list, the following new reference:

[IEC TR 60919-2:2008/AMD1:2015](https://standards.iteh.ai/catalog/standards/sist/e91dac76-9b78-4977-9501-9511692d57a0/iec-tr-60919-2-2008-amd1-2015)

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IEC/TS 60815-1:2008, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles*

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