

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Thyristor valves for high voltage direct current (HVDC) power transmission –
Part 1: Electrical testing **(standards.iteh.ai)**

Valves à thyristors pour le transport d'énergie en courant continu à haute
tension (CCHT) – <https://standards.iteh.ai/catalog/standards/sist/cbaf273d-1d58-4a34-b02d-9f705b7a/iec-60700-1-2015-amd1-2021>
Partie 1: Essais électriques





THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC online collection - oc.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

**Thyristor valves for high voltage direct current (HVDC) power transmission –
Part 1: Electrical testing** (standards.iteh.ai)

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.200

ISBN 978-2-8322-1012-9

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: Electrical testing

AMENDMENT 1

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. <https://standards.iteh.ai/catalog/standards/sist/ba277d-1d58-4a34-b02d-70555c-001061-natioamd1>
- 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 1 to IEC 60700-1:2015 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/604/CDV	22F/628/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/.

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

Replace the existing reference to IEC 61803:1999 and IEC 61803:1999/AMD1:2010, as well as its associated footnote, with:

IEC 61803:2020, *Determination of power losses in high-voltage direct current (HVDC) converter stations with line-commutated converters*

Replace the existing reference to ISO/IEC Guide 25, as well as its associated footnote, with:

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

3 Terms and definitions

3.1.4

valve protective firing

Delete the existing term and definition.

3.2 Valve construction terms

Delete subclause 3.2 and existing terms and definitions 3.2.1 to 3.2.7, without renumbering subsequent subclauses.

6.3.2 Valve support d.c. voltage test

Replace, in the second sentence of the first paragraph, “50 % of the maximum test voltage” with “50 % of 1 min test voltage”.

Delete, in the second sentence of the first paragraph, “in approximately 10 s”.

6.3.3 Valve support a.c. voltage test

Replace, in the second sentence of the first paragraph, “50 % of the maximum test voltage” with “50 % of 1 min test voltage”.

Replace, in the second sentence of the first paragraph, “within approximately 10 s” with “in approximately 10 s”.

7.2 Test object

Replace the existing second paragraph with the following new paragraph:

Individual valves may have to be short-circuited depending on the configuration of the MVU and objectives of the tests. The stresses on the different valves in the MVU depend on whether those valves belong to the same phase or to different phases.

iTeh STANDARD PREVIEW

7.3.1 MVU d.c. voltage test to earth

(standards.iteh.ai)

Replace, in the first sentence of the second paragraph, “50 % of the maximum test voltage” with “50 % of 1 min test voltage”.

[IEC 60700-1:2015/AMD1:2021](https://standards.iteh.ai/catalog/standards/sist/cba1273d-1d58-4a34-b02d-356c91705b7a/iec-60700-1-2015-amd1-2021)

Delete in the first sentence of the second paragraph “in approximately 10 s”.

<https://standards.iteh.ai/catalog/standards/sist/cba1273d-1d58-4a34-b02d-356c91705b7a/iec-60700-1-2015-amd1-2021>

7.3.4 MVU lightning impulse test

Replace the existing last paragraph by the following new paragraph:

Subject to agreement between the purchaser and supplier, the MVU lightning impulse test need not be performed, if it can be shown by other means that:

- a) the external air clearances to other valves and to earth are adequate for the lightning impulse voltage withstand level required, and
- a) the lightning impulse withstand between any two terminals of the MVU is adequately demonstrated by other tests.

8.1 Purpose of tests

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

It should be also noted that the atmospheric correction is not needed in dielectric tests between valve terminals. However, for valves installed at an altitude exceeding 1 000 m the valve internal air clearance shall be verified by additional tests under the atmospheric corrected test voltages. Thyristors and snubber circuits can be replaced by insulating blocks in these tests.

8.3.1 Valve d.c. voltage test

Replace, in the first sentence of the second paragraph, “50 % of the maximum test voltage” with “50 % of 1 min test voltage”.

Replace, in the first sentence of the second paragraph, “within approximately 10 s” with “in approximately 10 s”.

Replace the existing formula with:

$$U_{tdv} = \pm U_{dn} \times k_7$$

8.3.2 Valve a.c. voltage test

Replace, in the second sentence of the first paragraph, “50 % of the maximum test voltage” with “50 % of 15 s test voltage”.

Replace, in the second sentence of the first paragraph, “within approximately 10 s” with “in approximately 10 s”.

iTeh STANDARD PREVIEW

8.3.3 Valve impulse tests (general)

Replace, under the formula, the line for V_{DSM} with:

[IEC 60700-1:2015/AMD1:2021](https://standards.iteh.ai/catalog/standards/sist/cha273d-1d58-4a34-b02d-35bc9f705b7a/iec-60700-1-2015-amd1-2021)

V_{DSM} is the non-repetitive peak off-state voltage of the thyristors;

<https://standards.iteh.ai/catalog/standards/sist/cha273d-1d58-4a34-b02d-35bc9f705b7a/iec-60700-1-2015-amd1-2021>

9.3.2.4 Heat-run test

Replace, under the formula, “(see 5.1.4 of IEC 61803, 1999)” with “(see 5.1.5 of IEC 61803:2020)”.

9.3.6 Intermittent direct current tests

Replace the existing item b) with:

b) rectifier minimum α operation with minimum a.c. voltage (see 9.3.4.2).

Add, before the existing note, the following new paragraph:

In case of any insufficient number of current loops during the test to verify the gate firing function adequately, additional evidences shall be given.

11.3.3 Multi-loop fault current test without re-applied forward voltage

Replace the existing last-but-one paragraph of this subclause with the following:

The peak value and conduction duration of the fault current loops shall be determined in the same manner as defined in 11.3.2 except that, for all fault loops after the first, the delay angle of initiation shall be set to 0°.

16 Presentation of type test results

Replace the existing introductory paragraph of the list with the following:

The test report shall be issued in accordance with the general guidelines as given in ISO/IEC 17025, and shall include the following information:

A.1 General

Replace the existing fourth paragraph with the following:

When type tests are performed according to IEC 60060-1, the allowance of the test values amounts to 3 % for expanded uncertainties and a further maximum 3 % for the test level tolerance.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

A.2.1.3 Assessment of test safety factor alternatives for impulse tests

Replace the first dashed item under d) with the following:
IEC 60700-1:2015/AMD1:2021
<https://standards.iteh.ai/catalog/standards/sist/cba1273d-1d58-4a34-b02d-35bc9f705b7a/iec-60700-1-2015-amd1-2021>

- expanded uncertainty on test voltage (0,03 per IEC 60060);

Bibliography

Add, at the end of the existing Annex B, the following new bibliography and reference:

BIBLIOGRAPHY

IEC 60700-2, *Thyristor valves for high voltage direct current (HVDC) power transmission – Part 2: Terminology*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 60700-1:2015/AMD1:2021](https://standards.iteh.ai/catalog/standards/sist/cbaf273d-1d58-4a34-b02d-35bc9f705b7a/iec-60700-1-2015-amd1-2021)

<https://standards.iteh.ai/catalog/standards/sist/cbaf273d-1d58-4a34-b02d-35bc9f705b7a/iec-60700-1-2015-amd1-2021>

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**VALVES À THYRISTORS POUR LE TRANSPORT D'ÉNERGIE
EN COURANT CONTINU À HAUTE TENSION (CCHT) –****Partie 1: Essais électriques****AMENDEMENT 1****AVANT-PROPOS**

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments du présent document de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets.

L'Amendement 1 de l'IEC 60700-1:2015 a été établi par le sous-comité 22F: Électronique de puissance pour les réseaux électriques de transport et de distribution, du comité d'études 22 de l'IEC: Systèmes et équipements électroniques de puissance.