

TECHNICAL REPORT

AMENDMENT 1

**Guidelines for operation and maintenance of line commutated converter (LCC)
HVDC converter station**

IECNORM.COM : Click to view the full PDF of IEC TR 63065:2017/AMD1:2022



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2022 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.

IEC Secretariat
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 It also gives information on projects, replaced and withdrawn publications.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 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.

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.

IEC Products & Services Portal - products.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.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IECNORM.COM : Click to view the full PDF of IEC 60384-17/AMD1:2022

TECHNICAL REPORT

AMENDMENT 1

**Guidelines for operation and maintenance of line commutated converter (LCC)
HVDC converter station**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.200; 29.240.01

ISBN 978-2-8322-2077-1

Warning! Make sure that you obtained this publication from an authorized distributor.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

GUIDELINES FOR OPERATION AND MAINTENANCE OF LINE COMMUTATED CONVERTER (LCC) HVDC CONVERTER STATION

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.
- 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 TR 63065:2017 has been prepared by IEC technical committee 115: High Voltage Direct Current (HVDC) transmission for DC voltages above 100 kV.

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

Draft	Report on voting
115/280/DTR	115/294/RVDTR

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.

Add the following new Subclause 4.4.9 after the existing Subclause 4.4.8:

4.4.9 Fire protection system

4.4.9.1 Operating

a) Enable or disable the automatic function

The fire fighting system for converter transformers would be set to automatic mode when the converter transformer is energized so that in case of fire, the fire fighting system can take appropriate action automatically, e.g., spray water, foam or gas extinguishing agent.

In case of fire of thyristor valves, circulation fans should be stopped and smoke exhaust windows be closed automatically.

The fire fighting system can be set to manual mode when converter transformers and thyristor valves are deenergized and if the fire fighting system might malfunction during maintenance.

b) Activated remotely or locally

The fire fighting system can be activated remotely from an operator's workstation, or locally by opening the supply valve of the deluge systems. Appropriate safety measures shall be taken before approaching close to a transformer or valve hall that is on fire.

4.4.9.2 Monitoring from human-machine interface (HMI)

Check alarms from fire detection devices such as high-temperature sensors, ultraviolet flame detectors, and very early smoke detection apparatus.

4.4.9.3 Inspecting locally

Check the extinguishing agent supply pipes for leakage. Check if the valves are in the correct position.

4.4.9.4 Typical fault / alarm handling

a) Converter transformer fire fighting system activated

Check remotely through a video system or locally to confirm whether there is a fire. If there is a fire, make sure the converter transformers have been tripped, the firefighting system has been activated and the fire pumps are working correctly. Report to the local fire department or fire agent and ask for support.

For a 300 MW transformer with more than 100 tonnes of oil inside, it usually takes more than one hour to extinguish such a fire, with the fire fighting system continuously spraying the fire extinguishing medium at the required pressure and speed. So it is important that the converter station has adequate water, either from nearby rivers, or from the municipal water supply system, or from a reservoir at the station.

Besides keeping the Fire protection system working smoothly, operators on site can do some auxiliary firefighting work, such as to guide and assist external fire engines to extinguish the fire, to spray water to the transformer with fire hoses and fire hydrant, to seal cable trenches near the transformers with sand.

Special attention would be given to the sealing system for the converter transformer valve side bushings. If the sealing system catches fire, it is possible that high temperature fumes and the incomplete combustion transformer oil might access the valve hall from the broken sealing system, and spread fire into the valve hall.

b) Transformer protection trip

Check remotely through the video system or locally to confirm whether or not there is a fire. If there is a fire and the fire fighting system is not working, activate the fire fighting system remotely or locally, report to the local fire department and help to put out the fire.

c) Very early smoke detection apparatus alarm from valve hall

Since thyristor valves were built of material containing fire retardant elements, and adequate barriers and sealing materials were used to prevent fire propagation to adjacent modules and levels, it is usually much easier to put out a thyristor valve fire than a transformer fire.

If there is a very early smoke detection apparatus alarm, operators can confirm the presence of smoke, fire, or flash, either by video system or locally at the inspection corridor. If there is smoke, fire or flash, emergency stop the converter, isolate it from AC side, turn off the valve hall ventilation system and close the smoke exhaust window. Most likely the fire will extinguish automatically. Do not open the valve hall door and the smoke exhaust window until making sure the fire is completely put out.

In some applications, very early smoke detection apparatus or conventional smoke detectors send signals to other systems (valve hall ventilation system and HVDC control and protection system, etc.) to initiate protective actions automatically such as shutting down the valve hall ventilation system and tripping faulted HVDC pole trip, etc.

d) Fire alarm from cables

As the insulation of power supply cables decreases, this can lead to a fire. In most cases the power supply cables and the signal or protection cables share the same cable trench or cable tray, so it is possible that protection devices will not work in this case and lead to an expansion of the failure scope. So sensors such as temperature sensing cables can be installed inside the cable trench. Once there is an alarm, operators can seal the cable trench with sand to prevent fire from spreading to other equipment.

Add the following new Subclause 5.2.5 after the existing Subclause 5.2.4:

5.2.5 Routine maintenance for Fire protection system

During normal operation, the following work needs to be carried out for the fire protection system:

- a) Check the water supply pipes for leakage if the fire pump starts up too frequently;
- b) Check the water level of the site reservoir every week;
- c) Switching the redundant fire pumps every month to make sure both fire pumps are working normally and can set up pressure;
- d) Organize at least one fire emergency drill per year.

Add the following new Subclause 5.3.8 after the existing Subclause 5.3.7:

5.3.8 Fire protection system

Under power outage, the following work can be done for the fire protection system:

- a) Testing the fire detection device such as temperature sensing cables for transformers, very early smoke detection apparatus and ultraviolet flame detectors for the valve hall.
- b) Checking the nozzles of the firefighting system whether or not clogging.
- c) Fixing the pipe leakage, if any.
- d) Fire extinguisher agent spray test once a year.
- e) Foam effectiveness test every 4 years (for the premixed foam spray system only).
- f) Nitrogen bottle pressure test (for the premixed foam spray system only).

IECNORM.COM : Click to view the full PDF of IEC TR 63065:2017/AMD1:2022