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# TECHNICAL REPORT

## Water cooling systems for power electronics used in electrical transmission and distribution systems

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# WATER COOLING SYSTEMS FOR POWER ELECTRONICS USED IN ELECTRICAL TRANSMISSION AND DISTRIBUTION SYSTEMS

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IEC TR 63259 has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment. It is a Technical Report.

The text of this Technical Report is based on the following documents:

| Draft | Report on voting |
|---|---|
| 22F/650/DTR | 22F/668/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 Technical Report 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- withdrawn,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.

# INTRODUCTION

In the power transmission and distribution systems, power electronic equipment, such as LCC-HVDC (line commutated converter high voltage direct current) converter valve, VSC-HVDC (voltage sourced converter high voltage direct current) converter valve, SVC (static var compensator), STATCOM (static synchronous compensator) and power distribution cabinets, are mainly used for the conversion and control of current. Heat emitted from power electronics, like thyristors, IGBTs or other kinds, needs to be removed continuously. Water cooling system is commonly used as an efficient way to remove the heat from power electronic equipment, especially when operation voltage of equipment reaches 1 000 V or above. To meet the insulation requirement, water needs to be deionized to have the property of least conductivity. De-ionized water can be mixed with antifreeze or other solutes to achieve lower freezing point or obtain other characteristics.

As one of the most important auxiliary parts of power transmission and distribution systems, a great deal of research and practices have been made in many countries and relevant national standards or enterprise standards have been established. This document collects experience of design, manufacturing, and testing in different fields and provides a guideline for further application. However, the supplier is not necessarily required to provide all functions that are included/described in this document, unless clearly specified/required by the purchaser.

# WATER COOLING SYSTEMS FOR POWER ELECTRONICS USED IN ELECTRICAL TRANSMISSION AND DISTRIBUTION SYSTEMS

## 1 Scope

This document provides guidelines for the application of water cooling systems for power electronics used in electrical transmission and distribution systems.

This document describes a kind of water cooling system, in which de-ionized water or de-ionized water mixed with other solutes is used as the heat transfer agent for the removal of heat from power electronic equipment. Water cooling system can be separated into main circuit, and control and protection system. Other cooling systems, in which de-ionized water is not the heat transfer agent, are excluded in this document.

This document provides guidance and supporting information for both purchaser(s) and potential supplier(s). It can be used as the basis for drafting a procurement specification and as a guide during project implementation.

NOTE Usually, the agreement between the purchaser and the supplier of the water cooling system includes specific requirements regarding contractual requirements of particular delivery. Such specific requirements will supersede the general/typical description mentioned in this document, and all functions mentioned in this document are not necessarily applicable/delivered for all systems.

## 2 Normative references

There are no normative references in this document.