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Superconducting ac power cables and their accessories for rated voltages from 6 kV to 500 kV – Test methods and requirements

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International Standard IEC 63075 has been prepared by IEC technical committee 20: Electric cables.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
20/1858/FDIS	20/1865/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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- withdrawn,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.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

As a result of major developments in superconducting cable systems with cold dielectric for medium- and high-voltage AC applications, CIGRE study committee B1 set up working group (WG) B1.31 in 2009 with the aim to prepare recommendations for testing superconducting AC cable systems for power transmission at a rated voltage of up to 150 kV.

The recommendations of CIGRE WG B1.31 were published in TB 538 in June 2013 [1][1]. At the time of preparation of the CIGRE recommendation, laboratory experience at voltages up to and including 275 kV was available, but operating experience was limited to 154 kV. At the time of preparation of this document, several projects up to 220 kV are in progress, and many others are planned for the near future. As the insulation system of high-temperature superconducting (HTS) cable systems considered in this document is comparable to oil-filled cable systems, it was agreed to extend the voltage range to 500 kV in order to be compatible with IEC 60141-1 [2].

In 2014, TC 20 decided to start the standardization work on testing of HTS AC cables based on the published CIGRE TB 538. Manufacturers of HTS cable systems, utilities as the main users, and independent test laboratories will benefit from this document.

A list of relevant references is given in the Bibliography (see [3], [4], [5], [6]).

1 Numbers in square brackets refer to the Bibliography.

SUPERCONDUCTING AC POWER CABLES AND THEIR ACCESSORIES FOR RATED VOLTAGES FROM 6 KV TO 500 KV – TEST METHODS AND REQUIREMENTS

1 Scope

This document specifies test methods and requirements for high-temperature superconducting (HTS) AC power cable systems, cables and their accessories, for fixed installations, for rated voltages from 6 kV (U_m = 7,2 kV) up to and including 500 kV (U_m = 550 kV).

The requirements apply to single-core, three-core and three-phase concentric cables with cold dielectric and their accessories that are not intended for fault current limitation purposes.

This document does not cover special cables and their accessories, such as fault current limiting cables or submarine cables, for which modifications to the standard tests may be necessary or special test conditions may need to be devised.

This document does not cover test methods and requirements for the cooling system.

NOTE For considerations regarding cooling systems, refer to Annex A.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60229:2007, *Electric cables – Tests on extruded oversheaths with a special protective function*

IEC 60230, *Impulse tests on cables and their accessories*

IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

IEC 60811-202, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath*

IEC 60811-203, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 203: General tests – Measurement of overall dimensions*

IEC 60811-401, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods. Ageing in an air oven*

IEC 60811-409, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 409: Miscellaneous tests – Loss of mass test for thermoplastic insulations and sheaths*

IEC 60811-501, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 501: Mechanical tests – Tests for determining the mechanical properties of insulation and sheathing compounds*

IEC 60811-505, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 505: Mechanical tests – Elongation at low temperature for insulations and sheaths*

IEC 60811-506, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 506: Mechanical tests – Impact test at low temperature for PVC insulations and sheaths*

IEC 60811-508, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 508: Mechanical tests – Pressure test at high temperature for insulations and sheaths*

IEC 60811-509, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 509: Mechanical tests – Tests for resistance of insulations and sheaths to cracking (heat shock test)*

IEC 60811-605, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 605: Physical tests – Measurement of carbon black and/or mineral filler in polyethylene* compounds

IEC 60885-3, *Electrical test methods for electric cables – Part 3: Test methods for partial discharge measurements on lengths of extruded power cables*