

INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references	9
3 Terms and definitions	10
3.1 Definitions of dimensional values (thicknesses, cross-sections, etc.)	10
3.2 Definitions concerning tests	10
3.3 Other definitions (general design and cryogenic system).....	11
4 Voltage and current designations.....	13
4.1 Rated voltages.....	13
4.2 Rated operating current	13
5 Cable materials	14
5.1 Cable conductor materials	14
5.2 Cable insulating materials (dielectric insulation).....	14
5.3 Cable screen materials	14
5.4 Cable cryostat materials (thermal insulation).....	14
5.5 Cable oversheathing materials (outside cryostat).....	14
6 Cable characteristics	14
7 Accessory characteristics	15
8 Test conditions	16
8.1 Ambient temperature.....	16
8.2 Frequency and waveform of power frequency test voltages.....	16
8.3 Wave form of impulse test voltages.....	16
8.3.1 Lightning impulse voltage	16
8.3.2 Switching impulse voltage.....	16
8.4 Relationship of test voltages to rated voltages	16
8.5 Cryogen temperature and pressure	17
9 Routine tests on cables and on prefabricated accessories	17
9.1 General.....	17
9.1.1 Tests on cable core samples	17
9.1.2 Tests on cable cryostat.....	17
9.1.3 Tests on prefabricated accessories.....	17
9.2 AC voltage test for cable followed by partial discharge test.....	18
9.2.1 General	18
9.2.2 Procedure.....	18
9.2.3 Requirement.....	18
9.3 Critical current measurement	18
9.3.1 General	18
9.3.2 Procedure.....	18
9.3.3 Requirement.....	19
9.4 Pressure test	19
9.4.1 General	19
9.4.2 Procedure.....	19
9.4.3 Requirement.....	19
9.5 Vacuum leak test	19
9.5.1 General	19

9.5.2	Procedure.....	19
9.5.3	Requirement.....	19
9.6	Electrical test on oversheath of the cable.....	19
9.7	Tests on prefabricated accessories.....	19
9.7.1	Voltage test followed by partial discharge test	19
9.7.2	Pressure test and vacuum leak test	20
10	Sample tests on cables.....	20
10.1	General.....	20
10.2	Frequency of tests	20
10.3	Repetition of tests.....	20
10.4	Conductor examination	20
10.5	Measurement of thickness of cable insulation	21
10.5.1	General	21
10.5.2	Procedure.....	21
10.5.3	Requirement.....	21
10.6	Measurement of thickness of oversheath	21
10.6.1	General	21
10.6.2	Requirement.....	21
10.7	Measurement of diameters.....	21
10.8	Measurement of capacitance	21
10.9	Lightning impulse voltage test.....	22
11	Sample tests on accessories	22
11.1	Tests on components.....	22
11.2	Tests on complete accessory	22
12	Type tests on cable systems.....	23
12.1	General.....	23
12.2	Range of type approval	23
12.3	Summary of type tests	24
12.4	Electrical type tests on complete cable systems.....	24
12.4.1	Test voltage values.....	24
12.4.2	Tests and sequence of tests	24
12.4.3	Bending test	25
12.4.4	Critical current measurement.....	25
12.4.5	Pressure test	25
12.4.6	Thermal cycle test	26
12.4.7	Partial discharge test.....	26
12.4.8	Tan δ measurement.....	26
12.4.9	Load cycle voltage test	26
12.4.10	Impulse voltage tests.....	26
12.4.11	Examination of cable and accessories	27
12.5	Non-electrical type tests on cable components and on complete cable.....	27
12.5.1	Overview on non-electrical type tests.....	27
12.5.2	Check of cable construction.....	28
12.5.3	Tests for determining the mechanical properties of oversheaths before and after ageing	28
12.5.4	Loss of mass test on PVC oversheaths of type ST ₂	28
12.5.5	Test on PVC oversheaths (ST ₁ and ST ₂) at low temperature.....	28
12.5.6	Heat shock test for PVC oversheaths (ST ₁ and ST ₂).....	29

12.5.7	Measurement of carbon black content of black PE oversheaths (ST ₃ and ST ₇)	29
12.5.8	Test under fire conditions	29
12.5.9	Pressure test of cable cryostat.....	29
12.5.10	Pressure test of components of accessories	30
13	Prequalification test of the cable system	30
14	Type test on cables	30
15	Type test on accessories	30
16	Tests after installation	30
16.1	General.....	30
16.2	Tests at ambient temperature	31
16.2.1	Vacuum test	31
16.2.2	Pressure test	31
16.3	Tests at operating temperature	32
16.3.1	General	32
16.3.2	DC current test	32
16.3.3	AC voltage test of the insulation	32
16.3.4	DC voltage test of the oversheath	33
Annex A	(informative) Cooling system considerations	37
A.1	Introductory remarks	37
A.2	Cryogenic refrigeration.....	37
A.2.1	General process	37
A.2.2	General hardware components	38
A.3	Recommendations for tests after installation	39
A.3.1	General	39
A.3.2	Pressure test followed by vacuum leak test.....	39
A.3.3	Cooling capacity test and efficiency measurement	40
A.3.4	Circulation pump mass flow and pressure test	40
A.3.5	Temperature and pressure control test	40
A.3.6	Noise measurements	40
A.3.7	Other measurements	40
Annex B	(normative) Critical current measurement	41
B.1	Critical current measurement test	41
B.1.1	General	41
B.1.2	Procedure.....	41
B.1.3	Test method	41
Annex C	(informative) Tests for engineering information	43
C.1	Overview.....	43
C.2	AC loss	43
C.2.1	General	43
C.2.2	Electrical method	43
C.2.3	Calorimetric – vaporization method	43
C.2.4	Calorimetric – cryogen mass flow method	43
C.3	Heat invasion of cryostat.....	44
C.3.1	General	44
C.3.2	Calorimetric – vaporization of liquid cryogen.....	44
C.3.3	Calorimetric – liquid cryogen mass flow method.....	44
C.4	Electrical parameters	44

C.5	Short-circuit tests (fault current)	44
Annex D (informative)	List of type tests on cable systems	45
Annex E (normative)	Tests on outer protection for joints	46
E.1	General	46
E.2	Range of approval	46
E.3	Voltage tests	46
E.3.1	General	46
E.3.2	Assemblies embodying accessories without sheath sectionalizing insulation	46
E.3.3	Assemblies embodying sheath sectionalizing insulation	46
E.4	Examination of test assembly	47
Annex F (informative)	Prequalification test of the cable system	48
Bibliography		49
Figure A.1	General refrigeration process with indication of temperature and energy flows	37
Figure A.2	General system components and process flow	39
Figure B.1	Test setup for electrical four-probe method	41
Figure B.2	Voltage-current characteristic for superconductor	42
Table 1	Test voltages	34
Table 2	Non-electrical type tests for oversheathing compounds for cables	35
Table 3	Test requirements for mechanical characteristics of oversheathing compounds for cables (before and after ageing)	36
Table 4	Test requirements for particular characteristics of PVC oversheathing for cables	36
Table D.1	Type tests on cable systems	45
Table E.1	Impulse voltage tests	47

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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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

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- withdrawn,
- replaced by a revised edition, or
- amended.

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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*