

TECHNICAL REPORT



Guidelines for parameters measurement of HVDC transmission line

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.240.20

ISBN 978-2-8327-0070-9

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	8
4 General	9
4.1 Background.....	9
4.2 Measurement items.....	10
4.3 Measurement conditions	10
4.4 Safety precautions	10
4.5 Measurement instruments	10
5 Induced voltage and induced current measurement	11
5.1 General.....	11
5.2 Induced voltage measurement	11
5.3 Induced current measurement.....	12
6 Insulation resistance measurement.....	12
7 Polarity verification	13
7.1 Polarity verification method using megohmmeter	13
7.2 Polarity verification method using a battery	14
8 Measurement of DC resistance.....	14
9 Measurement of frequency characteristics of HVDC transmission line	16
9.1 General.....	16
9.2 Differential mode measurement	17
9.2.1 Measuring the differential mode short-circuit impedance.....	17
9.2.2 Measuring the differential mode open-circuit impedance.....	17
9.2.3 Calculating the frequency characteristics of differential mode parameters	17
9.3 Common mode measurement.....	18
9.3.1 Measuring the common mode short-circuit impedance	18
9.3.2 Measuring the common mode open-circuit impedance	18
9.3.3 Calculating the frequency characteristics at common mode parameters.....	19
9.4 Calculating the coupling parameters of pole line I and pole line II	20
10 Measurement of coupling parameters of two bipolar HVDC transmission lines.....	20
10.1 Measuring frequency characteristics at differential mode measurement	20
10.2 Measuring frequency characteristics at common mode measurement.....	21
10.3 Calculating the mutual coupling parameters	22
11 Measurement of frequency characteristics of HVDC transmission line with dedicated metallic return line	22
12 Measurement of frequency characteristics of HVDC cable	24
13 Measurement of earth electrode line parameter	24
Annex A (informative) Anti-interference measures	26
Annex B (informative) Method for locating faults of transmission line	27
B.1 Overview.....	27
B.2 Location of earthing faults.....	27
B.3 Location of open-circuit faults	28

B.4	Location of bipolar short-circuit faults.....	28
B.5	Location of multiple faults	29
Annex C (informative)	Principle of measuring distributed parameters	30
C.1	Distributed parameter circuit of the transmission line	30
C.2	Definitions.....	30
C.3	Telegraph equations	30
C.4	Calculation of distributed parameters	31
Annex D (informative)	Case of measurement of transmission line parameters.....	33
D.1	Base data	33
D.2	Calculating process	34
D.2.1	General	34
D.2.2	Calculation of characteristic impedance and transmission constant	34
D.2.3	Calculation of per unit length value of impedance and admittance	34
D.2.4	Calculation of parameter in unit length.....	35
D.3	Calculation of parameter in unit length under each selected frequency	35
D.4	Curve fitting	36
D.4.1	General	36
D.4.2	R - f curve under the bipolar parallel measuring mode.....	36
D.4.3	L - f curve under the bipolar parallel measuring mode.....	36
Bibliography	38
Figure 1	– Induced voltage test with the ending terminal open-circuited.....	11
Figure 2	– Induced voltage test with the ending terminal short-circuited.....	12
Figure 3	– Induced current test	12
Figure 4	– Insulation resistance test of pole line I	13
Figure 5	– Polarity verification of pole line I	13
Figure 6	– Polarity verification for pole I using battery.....	14
Figure 7	– Measurement of DC resistance	15
Figure 8	– Measurement of DC resistance with dedicated metallic return.....	15
Figure 9	– Measurement of differential mode short-circuit impedance	17
Figure 10	– Measurement of differential mode open-circuit impedance	17
Figure 11	– Measurement of common mode short-circuit impedance.....	19
Figure 12	– Measurement of common mode open-circuit impedance.....	19
Figure 13	– Measurement of differential mode short circuit impedance for two bipolar transmission lines	21
Figure 14	– Measurement of differential mode open circuit impedance for two bipolar transmission lines	21
Figure 15	– Measurement of common mode short circuit impedance for two bipolar transmission line.....	22
Figure 16	– Measurement of common mode open circuit impedance for two bipolar transmission line.....	22
Figure 17	– Measurement of differential mode short-circuit impedance with metallic return line	23
Figure 18	– Measurement of differential mode open-circuit impedance with metallic return line	23
Figure 19	– Measurement of common mode short-circuit impedance with metallic return line	23

Figure 20 – Measurement of common mode open-circuit impedance with metallic return line 24

Figure 21 – Measurement of common mode short-circuit impedance of HVDC cable..... 24

Figure 22 – Measurement of common mode open-circuit impedance of HVDC cable..... 24

Figure 23 – Equivalent circuit of earth electrode line 25

Figure A.1 – Anti-interference measures 26

Figure B.1 – Location of earthing faults..... 27

Figure B.2 – Location of open-circuit faults 28

Figure B.3 – Location of bipolar short circuit faults..... 28

Figure C.1 – Distributed parameter circuit of the transmission line 30

Figure D.1 – R - f curve under the bipolar parallel measuring mode 36

Figure D.2 – L - f curve under the bipolar parallel measuring mode..... 37

Table D.1 – Open circuit impedance and short circuit impedance under the bipolar parallel measuring mode 33

Table D.2 –Line parameters within 30 Hz, 2 500 Hz..... 35

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**GUIDELINES FOR PARAMETERS MEASUREMENT OF
HVDC TRANSMISSION LINE**
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IEC TR 63502 has been prepared by IEC technical committee TC 115: High Voltage Direct Current (HVDC) transmission for DC voltages above 100 kV. It is a Technical Report.

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

Draft	Report on voting
115/374/DTR	115/386/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/publications.

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INTRODUCTION

The development of global clean energy exacerbates uneven distributions of electrical energy, which intensifies the demand for HVDC transmission techniques as a high-efficiency long-distance transmission solution of the energy. Parameters of DC lines (e.g. overhead lines, cables, or their combination) are essential in modelling transmission lines in computations, of which the accuracy greatly affects the analysis results of the DC transmission system and the correctness of determining operating strategies. However, the parameters of DC lines are sensitive to the geological structures, weather characteristics along the transmission corridors, earthing modes and other uncertainties, which make the theoretical values of parameters invalid. Thus, on-site measurement is important.

The parameter testing of DC lines is generally carried out after the construction or renovation of DC projects. The measured parameters of DC transmission lines are important for several applications, mainly including DC transmission system steady-state calculation, transient calculation, fault analysis, electromagnetic environment calculation, construction quality assessment after newly launched HVDC project or renovation, etc. The test results of line parameters can be used to verify whether the actual parameters meet the requirements of engineering design. In steady-state calculation, DC resistance is generally used for power flow computation, voltage drop computation, and resistance loss computation under different operating modes. In transient calculation, the resistance, capacitance, inductance of the DC line in per-unit length and its frequency characteristics are essential in performing the over-voltage calculations under lightning strike, operation, fault, and other working conditions. In electromagnetic environment calculation, the capacitance analysis of the DC line is the prerequisite for the calculations of the surface electric field for the wire, the nominal electric field and ion flow electric field generated by the DC line in the surrounding space, which further give the important performance data of the DC line, including audible noise, radio interference, corona loss, etc.

Based on the accurate descriptions of DC line parameters, considering the actual needs of the above applications, the main DC line parameters described in this document are the DC resistance and frequency characteristics. Frequency characteristics refer to the response of line resistance per unit length, inductance, and capacitance as well as the necessary coupling capacitance and inductance under different frequencies.

This document introduces measurement specification, including measurement conditions, safety precautions, measurement instruments, measurement methods, etc., in order to measure the parameters of HVDC overhead transmission line and cable with a DC voltage level above 100 kV.

GUIDELINES FOR PARAMETERS MEASUREMENT OF HVDC TRANSMISSION LINE

1 Scope

This document gives information relevant to the on-site HVDC transmission line parameter measurement. HVDC transmission line can be overhead lines, land or submarine cables, or hybrid lines with overhead line section(s) and cable section(s) (or any combination of these).

This document is also relevant to line parameter measurement of earth electrode lines in HVDC power transmission systems.

2 Normative references

There are no normative references in this document.