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High-voltage switchgear and controlgear – Part 315: Direct current (DC) transfer switches

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CONTENTS

FOREWORD 8
INTRODUCTION to IEC TS 62271-5:2024 10
1 Scope 11
2 Normative references 11
3 Terms and definitions 14
3.1 General terms and definitions 14
3.2 Assemblies of switchgear and controlgear 19
3.3 Parts of assemblies 19
3.4 Switching devices 19
3.5 Parts of switchgear and controlgear 22
3.6 Operational characteristics of switchgear and controlgear 27
3.7 Characteristic quantities 31
3.8 Index of definitions 33
4 Normal and special service conditions 36
4.1 Normal service conditions 36
4.2 Special service conditions 38
5 Ratings 39
5.1 General 39
5.2 Rated direct voltage (U_{rd}) 40
5.3 Rated insulation level (U_{dd}, U_p, U_s) 40
5.4 Rated continuous current (I_{rd}) 44
5.5 Rated values of short-time withstand current 44
5.6 Rated supply voltage of auxiliary and control circuits (U_a) 46
5.7 Rated supply frequency of auxiliary and control circuits 47
5.101 Rated direct voltage of transfer switch (U_{rts}) 48
5.102 Rated transfer current (I_t) 48
5.103 Rated commutation voltage (U_c) 48
5.104 Rated dissipated energy during transfer operation (E_{rd}) 48
5.105 Rated operating sequence 48
5.106 Rated open-close time 49
6 Design and construction 49
6.1 Requirements for liquids in switchgear and controlgear 49
6.2 Requirements for gases in switchgear and controlgear 49
6.3 Earthing of switchgear and controlgear 49
6.4 Auxiliary and control equipment and circuits 50
6.5 Dependent power operation 54
6.6 Stored energy operation 54
6.7 Independent unlatched operation (independent manual or power operation) 55
6.8 Manually operated actuators 56
6.9 Operation of releases 56
6.10 Pressure/level indication 57
6.11 Nameplates 57
6.12 Locking devices 60
6.13 Position indication 60
6.14 Degrees of protection provided by enclosures 60

6.15 Creepage distances for outdoor insulators 61
6.16 Gas and vacuum tightness 61
6.17 Tightness for liquid systems 62
6.18 Fire hazard (flammability) 62
6.19 Electromagnetic compatibility (EMC) 62
6.20 X-ray emission 62
6.21 Corrosion 63
6.22 Filling levels for insulation, switching and/or operation 63
6.101 Seismic requirement for operation 63
6.102 Commutation switch 63
6.103 Insulated platform 65
6.104 Commutation capacitor 65
6.105 Energy dissipation device 66
6.106 Reactor 66
6.107 Making switch (if applicable) 66
6.108 Charging device (if applicable) 66
7 Type tests 66
7.1 General 66
7.2 Dielectric tests 69
7.3 Resistance measurement 76
7.4 Continuous current tests 78
7.5 Short-time withstand current and peak withstand current tests 85
7.6 Verification of the protection 87
7.7 Tightness tests 87
7.8 Electromagnetic compatibility tests (EMC) 90
7.9 Additional tests on auxiliary and control circuits 95
7.10 X-radiation test for vacuum interrupters 97
7.101 Mechanical and environmental tests 100
7.102 Seismic tests 111
7.103 Direct current commutation tests 111
7.104 Direct arc withstand tests 115
8 Routine tests 118
8.1 General 118
8.2 Dielectric test on the main circuit 118
8.3 Tests on auxiliary and control circuits 119
8.4 Measurement of the resistance of the main circuit 120
8.5 Tightness test 120
8.6 Design and visual checks 121
8.101 Mechanical operating tests 121
9 Guide to the selection of switchgear and controlgear (informative) 122
9.1 General 122
9.2 Selection of rated values 123
9.3 Cable-interface considerations 124
9.4 Continuous or temporary overload due to changed service conditions 124
9.5 Environmental aspects 124
9.101 Selection of the application 125
10 Information to be given with enquiries, tenders and orders (informative) 127
10.1 General 127

10.2 Information with enquiries and orders 127
10.3 Information with tenders 129
11 Transport, storage, installation, operating instructions and maintenance 131
11.1 General 131
11.2 Conditions during transport, storage and installation 131
11.3 Installation 131
11.4 Operating instructions 134
11.5 Maintenance 134
12 Safety 137
12.1 General 137
12.2 Precautions by manufacturers 138
12.3 Precautions by users 138
13 Influence of the product on the environment 139
Annex A (informative) Examples of HVDC side switchgear arrangement for one pole in an HVDC substation 140
Annex B (informative) Exposure to pollution 142
B.1 General 142
B.2 Minimum requirements for switchgear in normal service condition 142
B.3 Minimum requirements for switchgear in special service condition 142
Annex C (informative) Preferred insulation levels for rated voltages lower than 105 kV 143
Annex D (informative) Short-circuit current in HVDC systems 144
D.1 VSC HVDC 144
D.2 LCC HVDC 145
D.3 Special case of LCC HVDC DC faults – LCC as diode bridge 145
D.4 HVDC systems with DC circuit-breakers 147
D.5 Calculation of the rated short-time withstand direct current 148
D.6 Calculation of Joule integral value (E_j) 149
Annex E (informative) References for auxiliary and control circuit components 150
Annex F (informative) List of symbols 152
Annex G (normative) Method for the weatherproofing test for outdoor switchgear and controlgear 154
Annex H (normative) Tolerances on test quantities during tests 157
Annex I (informative) Extension of validity of type tests 160
I.1 General 160
I.2 Dielectric tests 160
I.3 Short-time withstand current and peak withstand current tests 160
I.4 Electromagnetic immunity test on auxiliary and control circuits 160
I.5 Environmental tests on auxiliary and control circuits 160
Annex J (normative) Identification of test objects 162
J.1 General 162
J.2 Data 162
J.3 Drawings 162
Annex K (informative) Test circuit for superimposed impulse voltage tests 164
K.1 General 164
K.2 Test circuit using blocking capacitor 164
K.3 Test circuit using sphere gap 164

Annex L (informative) Information and technical requirements to be given with enquiries, tenders and orders 166
L.1 General 166
L.2 Normal and special service conditions (refer to Clause 4) 166
L.3 Ratings (refer to Clause 5) 167
L.4 Design and construction (refer to Clause 6) 167
L.5 System information 168
L.6 Documentation for enquiries and tenders 168
Annex M (informative) Electromagnetic compatibility on site 169
Annex N (informative) Standardization activities of HVDC 170
Annex A (normative) Test requirements for components of DC transfer switches 171
A.1 Commutation switch 171
A.2 Making switch 171
A.3 Commutation capacitor 171
A.4 Energy dissipation device 172
A.5 Reactor 172
A.6 Charging device 172
Annex B (informative) Additional information about test circuit and measured signals for DC transfer switches having an oscillation branch 174
B.1 Test circuits for direct current transfer test 174
B.2 Test circuits for direct arc withstand test 176
Annex C (normative) Tolerances on test quantities during tests 178
Annex D (normative) Records and reports of type tests 181
D.1 Information and results to be recorded 181
D.2 Information to be included in type test reports 181
Annex E (informative) Extension of validity of type tests 184
E.1 General 184
E.2 Dielectric tests 184
E.3 Continuous current test 184
E.4 Electromagnetic immunity test on auxiliary and control circuits 184
E.5 Environmental tests on auxiliary and control circuits 185
E.6 DC transfer current test 185
Bibliography 186

Figure 1 – Schematic representation of superimposed impulse voltage tests 43
Figure 2 – Typical waveform of a short-circuit current in an HVDC system 45
Figure 3 – Examples of classes of contacts 54
Figure 4 – Diagram of connections of a switching device 72
Figure 5 – Test sequence for polarity reversal tests 75
Figure 7 – Test location of radiation survey instrument 99
Figure 1 – Test sequence for low temperature test 106
Figure 2 – Test sequence for high temperature test 108
Figure 3 – Humidity test 110
Figure 4 – General layout of test circuit for direct current commutation test 113
Figure 5 – Current commutation test with low-frequency alternating current 114
Figure 6 – General layout of test circuit for direct arc withstand test 116

Figure 7 – Equivalent transfer circuit of MRTS and ERTS 125
Figure 8 – Equivalent transfer circuit of NBS 126
Figure 9 – Equivalent transfer circuit of NBES 127
Figure A.1 – Example of HVDC side switchgear arrangement for one pole in an HVDC substation 141
Figure D.1 – VSC HVDC under worst-case, pole-pole DC fault 144
Figure D.2 – LCC HVDC under worst-case, pole-pole DC fault 145
Figure D.3 – Special case LCC HVDC under worst-case, pole-pole DC fault 146
Figure D.4 – HVDC system with DC circuit-breaker under worst-case, pole-pole DC fault 147
Figure D.5 – DC circuit-breaker simple model 147
Figure D.6 – Equivalent fault current for calculation of rated short time withstand direct current 148
Figure G.1 – Arrangement for weatherproofing test 155
Figure G.2 – Nozzle for weatherproofing test 156
Figure K.1 – Test circuit for superimposed impulse tests using blocking capacitor 164
Figure K.2 – Test circuit for superimposed impulse tests using sphere gap 165
Figure B.1 – Test circuit with measuring points 174
Figure B.2 – Measured signals during test (overview) 175
Figure B.3 – Measured signals during test (expanded in time) 176
Figure B.4 – Test circuit of direct arc withstand tests 177

Table 1 – Preferred rated insulation levels 41
Table 1 – Rated insulation levels for transfer switches 44
Table 2 – Direct voltage of auxiliary and control circuits 47
Table 3 – Alternating voltage of auxiliary and control circuits 47
Table 4 – Auxiliary contact classes 53
Table 2 – Nameplate information 57
Table 5 – Nameplate information 59
Table 3 – Classification of commutation switches and making switches 65
Table 4 – Type tests 67
Table 6 – Test conditions in general case 72
Table 7 – Test conditions in case of impulse voltage tests across the isolating distance (or open switching device) 72
Table 8 – Test conditions in case of superimposed impulse voltage tests 73
Table 9 – Test conditions for polarity reversal tests 75
Table 10 – Limits of temperature and temperature rise for various parts, materials and dielectrics of high-voltage switchgear and controlgear 81
Table 11 – Permissible leakage rates for gas systems 88
Table 12 – Application of voltages at the fast transient/burst test 92
Table 13 – Application of voltage at the damped oscillatory wave test 93
Table 14 – Assessment criteria for transient disturbance immunity 94
Table 5 – Number of operating sequences for commutation switches 103
Table 6 – Number of operating sequences for making switches 103
Table C.1 – Preferred insulation levels for rated voltages lower than 105 kV 143

Table E.1 – List of reference documents for auxiliary and control circuit components..... 150
Table H.1 – Tolerances on test quantities for type test..... 157
Table J.1 Drawing list and contents 162
Table B.1 – Legend of measuring points 177
Table C.1 – Tolerances on test quantities for type test..... 178

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 315: Direct current (DC) transfer switches

FOREWORD

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This extended version (EXV) of the official IEC Standard provides the user with the full content of the Standard.

IEC TS 62271-315 EXV includes the content of IEC TS 62271-315:2025, and the references made to IEC TS 62271-5:2024.

The specific content of IEC TS 62271-315:2025 is displayed on a blue background.

IEC TS 62271-315 has been prepared by subcommittee 17A: Switching devices, of IEC technical committee 17: High-voltage switchgear and controlgear. It is a Technical Specification.

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

Draft	Report on voting
17A/1412/DTS	17A/1417/RVDTS

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 Specification 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.

This document is to be read in conjunction with IEC TS 62271-5:2024, to which it refers and which is applicable unless otherwise specified. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in IEC TS 62271-5. Amendments to these clauses and subclauses are given under the same references whilst additional subclauses are numbered from 101.

A list of all parts of IEC 62271 series, under the general title *High-voltage switchgear and controlgear* can be found on the IEC website.

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, or
- revised.

INTRODUCTION to IEC TS 62271-5:2024

This Technical Specification has been prepared by TC 17 and it defines common specifications for high-voltage direct current (HVDC) switchgear and controlgear covering both types of air insulated (AIS) and gas insulated (GIS) equipment of HVDC substations. This document includes rules for service conditions, ratings, design and construction requirements. Test requirements and criteria to proof for passing type and routine tests are defined in this document for development and manufacturing of HVDC switchgear.

This specification is applicable for both LCC and VSC HVDC technology.

SC 17A is in the process of preparing documents for the following HVDC switching devices:

– circuit-breakers (IEC TS 62271-313 [1])[1];
– disconnectors and earthing switches (IEC TS 62271-314 [2]);
– transfer switches (IEC TS 62271-315 [3]);
– by-pass switches and paralleling switches (IEC TS 62271-316 [4]).

SC 17C is in the process of preparing a document for DC gas insulated switchgears (IEC TS 62271-318 [5]).

Standardization of direct voltages is the responsibility of TC 8 (System aspects of electrical energy supply).

TC 99 (Insulation co-ordination and system engineering of high voltage electrical power installations above 1,0 kV AC and 1,5 kV DC) defines requirements of DC substations for safety of insulation, equipment, installation and earthing (IEC 61936-2).

TC 115 (High Voltage Direct Current (HVDC) transmission for DC voltages above 100 kV) is responsible for DC transmission system aspects. It is the responsibility of TC 115 to define requirements for different equipment (e. g. switching devices) from system point of view. These definitions are implemented in documents from other TCs. Several Working Groups and Maintenance Teams are preparing documents on reliability, EMC, asset management, system design, DC harmonics, testing, HVDC grids, VSC and LCC converter and insulation coordination for HVDC systems.

[1] Numbers in square brackets refer to the Bibliography.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 315: Direct current (DC) transfer switches

1 Scope

This part of IEC 62271 is applicable to direct current (DC) transfer switches designed for indoor or outdoor installation and for operation on HVDC transmission systems having direct voltages of 100 kV and above.

DC transfer switches normally include metallic return transfer switches (MRTS), earth return transfer switches (ERTS), neutral bus switches (NBS) and neutral bus earthing switches (NBES).

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 60038:2009, *IEC standard voltages*

IEC 60050-614:2016, *International Electrotechnical Vocabulary (IEV) – Part 614: Generation, transmission and distribution of electricity – Operation*

IEC 60050-811, *International Electrotechnical Vocabulary (IEV) – Part 811: Electric traction*

IEC 60050-826:2022, *International Electrotechnical Vocabulary (IEV) – Part 826: Electrical installations*

IEC 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-17:1994, *Basic environmental testing procedures – Part 2-17: Tests – Test Q: Sealing*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60071-1:2019, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60071-2:2018, *Insulation co-ordination – Part 2: Application guidelines*

IEC 60071-11:2022, *Insulation co-ordination – Part 11: Definitions, principles and rules for HVDC system*

IEC 60076-6, *Power transformers– Part 6: Reactors*

IEC 60085:2007, *Electrical insulation – Thermal evaluation and designation*

IEC 60099-9, *Surge arresters – Part 9: Metal-oxide surge arresters without gaps for HVDC converter stations*

IEC 60255-21-1:1988, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section One: Vibration tests (sinusoidal)*

IEC 60270:2000, *High-voltage test techniques – Partial discharge measurements*

IEC 60296, *Fluids for electrotechnical applications – Mineral insulating oils for electrical equipment*

IEC 60376, *Specification of technical grade sulphur hexafluoride (SF_6) and complementary gases to be used in its mixtures for use in electrical equipment*

IEC 60417:2006, *Graphical symbols for use on equipment (available at http://www.graphical-symbols.info/equipment)*

IEC 60437, *Radio interference test on high-voltage insulators*

IEC 60480, *Specifications for the re-use of sulphur hexafluoride (SF_6) and its mixtures in electrical equipment*

IEC 60512-2-2, *Connectors for electronic equipment – Tests and measurements – Part 2-2: Electrical continuity and contact resistance tests – Test 2b: Contact resistance – Specified test current method*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60633, *High-voltage direct current (HVDC) transmission – Vocabulary*

IEC TS 60815-4:2016, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 4: Insulators for DC systems*

IEC 60871-1, *Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V – Part 1: General*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61000-4-17:1999, *Electromagnetic compatibility (EMC) – Part 4-17: Testing and measurement techniques – Ripple on d.c. input power port immunity test*

IEC 61000-4-18:2019, *Electromagnetic compatibility (EMC) – Part 4-18: Testing and measurement techniques – Damped oscillatory wave immunity test*

IEC 61000-4-29, *Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on DC input power port immunity tests*

IEC 61000-6-2*, Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-5, *Electromagnetic compatibility (EMC) – Part 6-5: Generic standards – Immunity for equipment used in power station and substation environment*

IEC 61180, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*

IEC TS 61245, *Artificial pollution tests on high-voltage ceramic and glass insulators to be used on DC systems*

IEC 61810-7:2006, *Electromechanical elementary relays – Part 7: Test and measurement procedures*

IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

IEC 62271-1:2017, *High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear*
IEC 62271-1:2017/AMD1:2021

IEC 62271-4, *High-voltage switchgear and controlgear – Part 4: Handling procedures for gases for insulation and/or switching*

IEC TS 62271-5:2024, *High-voltage switchgear and controlgear – Part 5: Common specifications for direct current switchgear and controlgear*

IEC 62271-100:2021, *High-voltage switchgear and controlgear – Part 100: Alternating-current circuit-breakers*

IEC 62271-102:2018, *High-voltage switchgear and controlgear – Part 102: Alternating-current disconnectors and earthing switches*

IEC 62271-207, *High-voltage switchgear and controlgear – Part 207: Seismic qualification for gas-insulated switchgear assemblies for rated voltages above 52 kV*

IEC TS 63014-1, *High-voltage direct current (HVDC) power transmission – System requirements for DC-side equipment Part 1: Using line-commutated converters*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 16-1 (all parts), *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus*

CISPR TR 18-2, *Radio interference characteristics of overhead power lines and high-voltage equipment – Part 2: Methods of measurement and procedure for determining limits*

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High-voltage switchgear and controlgear – Part 315: Direct current (DC) transfer switches



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CONTENTS

FOREWORD 7
1 Scope 9
2 Normative references 9
3 Terms and definitions 10
3.1 General terms and definitions 10
3.2 Assemblies of switchgear and controlgear 10
3.3 Parts of assemblies 10
3.4 Switching devices 10
3.5 Parts of switchgear and controlgear 12
3.6 Operational characteristics of DC transfer switches 13
3.7 Characteristic quantities 13
3.8 Index of definitions 14
4 Normal and special service conditions 15
5 Ratings 16
5.1 General 16
5.2 Rated direct voltage (U_{rd}) 16
5.3 Rated insulation level (U_{dd}, U_p, U_s) 16
5.4 Rated continuous current (I_{rd}) 17
5.5 Rated values of short-time withstand current 17
5.5.1 Typical waveform of short-circuit current 17
5.5.2 Rated short-time withstand direct current (I_{kd}) 17
5.5.3 Rated peak withstand current (I_{pd}) 17
5.5.4 Rated duration of short circuit (t_{kd}) 17
5.6 Rated supply voltage of auxiliary and control circuits (U_a) 17
5.6.1 General 17
5.6.2 Rated supply voltage (U_a) 17
5.7 Rated supply frequency of auxiliary and control circuits 17
5.8 Rated pressure of compressed gas supply for controlled pressure systems 18
5.101 Rated direct voltage of transfer switch (U_{rts}) 18
5.102 Rated transfer current (I_t) 18
5.103 Rated commutation voltage (U_c) 18
5.104 Rated dissipated energy during transfer operation (E_{rd}) 18
5.105 Rated operating sequence 19
5.106 Rated open-close time 19
6 Design and construction 19
6.1 Requirements for liquids in switchgear and controlgear 19
6.2 Requirements for gases in switchgear and controlgear 19
6.3 Earthing of switchgear and controlgear 19
6.4 Auxiliary and control equipment and circuits 19
6.5 Dependent power operation 20
6.6 Stored energy operation 20
6.7 Independent unlatched operation (independent manual or power operation) 20
6.8 Manually operated actuators 20
6.9 Operation of releases 20

6.10 Pressure/level indication 20
6.11 Nameplates 20
6.12 Locking devices 22
6.13 Position indication 22
6.14 Degrees of protection by enclosures 22
6.15 Creepage distances for outdoor insulators 22
6.16 Gas and vacuum tightness 22
6.17 Tightness for liquid system 22
6.18 Fire hazard (flammability) 22
6.19 Electromagnetic compatibility (EMC) 22
6.20 X-ray emission 22
6.21 Corrosion 22
6.22 Filling levels for insulation, switching and operation 22
6.101 Seismic requirement for operation 22
6.102 Commutation switch 22
6.102.1 General requirement for operation 22
6.102.2 Pressure limits of fluids for operation. 23
6.102.3 Vent outlets 23
6.102.4 Time quantities 23
6.102.5 Static mechanical loads 23
6.102.6 Classification 24
6.102.7 Arcing withstand capability 24
6.103 Insulated platform 25
6.104 Commutation capacitor 25
6.105 Energy dissipation device 25
6.106 Reactor 25
6.107 Making switch (if applicable) 25
6.108 Charging device (if applicable) 25
7 Type tests 25
7.1 General 25
7.1.1 Basics 25
7.1.2 Information for identification of test objects 27
7.1.3 Information to be included in type-test reports 27
7.2 Dielectric tests 27
7.2.1 General 27
7.2.2 Ambient air conditions during tests 27
7.2.3 Wet test procedure 27
7.2.4 Arrangement of the equipment 27
7.2.5 Criteria to pass the test 27
7.2.6 Application of the test voltage and test conditions 27
7.2.7 Tests of switchgear and controlgear 28
7.2.8 Artificial pollution tests for outdoor insulators 29
7.2.9 Partial discharge tests 29
7.2.10 Dielectric tests on auxiliary and control circuits 29
7.2.11 Voltage test as condition check 29
7.3 Resistance measurement 29
7.3.1 Measurement of the resistance of auxiliary contacts class 1 and class 2 29
7.3.2 Measurement of the resistance of auxiliary contacts class 3 29
7.3.3 Electrical continuity of earthed metallic parts test 29

7.3.4 Resistance measurement of contacts and connections in the main circuit as a condition check 29
7.4 Continuous current tests 30
7.4.1 Condition of the test object 30
7.5 Short-time withstand current and peak withstand current tests 30
7.5.1 General 30
7.5.2 Arrangement of the equipment and of the test circuit 30
7.5.3 Test current and duration 30
7.5.4 Conditions of the test object after test 30
7.6 Verification of the protection 30
7.7 Tightness tests 30
7.8 Electromagnetic compatibility tests (EMC) 31
7.9 Additional tests on auxiliary and control circuits 31
7.10 X-radiation test for vacuum interrupters 31
7.101 Mechanical and environmental tests 31
7.101.1 Miscellaneous provisions for mechanical and environmental tests 31
7.101.2 Mechanical operation tests at ambient air temperature 33
7.101.3 Low and high temperature tests 35
7.101.4 Humidity test 40
7.101.5 Test to prove the operation under severe ice conditions 42
7.102 Seismic tests 42
7.103 Direct current commutation tests 42
7.103.1 General 42
7.103.2 Arrangement of the transfer switch during test 43
7.103.3 Test circuit 44
7.103.4 Test procedure 45
7.103.5 Behaviour of DC transfer switch during test 46
7.103.6 Criteria to pass the test 46
7.104 Direct arc withstand tests 46
7.104.1 General 46
7.104.2 Arrangement of the transfer switch during test 47
7.104.3 Test circuit 47
7.104.4 Test procedure 48
7.104.5 Behaviour of DC transfer switch during test 48
7.104.6 Criteria to pass the test 48
8 Routine tests 49
8.1 General 49
8.2 Dielectric test on the main circuit 49
8.3 Tests on auxiliary and control circuits 49
8.4 Measurement of the resistance of the main circuit 49
8.5 Tightness test 49
8.6 Design and visual checks 49
8.101 Mechanical operating tests 49
9 Guide to the selection of DC transfer switches （informative） 51
9.1 General 51
9.2 Selection of rated values 51
9.2.101 General 51
9.2.102 Selection of rated direct voltage of transfer switch and rated insulation level 51

9.2.103 Selection of rated operating sequence 51
9.2.104 Selection of rated continuous current 52
9.2.105 Selection of rated values of short time withstand current 52
9.2.106 Selection of rated transfer current 52
9.2.107 Selection of rated commutation voltage 52
9.3 Cable-interface considerations 52
9.4 Continuous or temporary overload due to changed service conditions 52
9.5 Environmental aspects 52
9.101 Selection of the application 52
9.101.1 MRTS 52
9.101.2 ERTS 53
9.101.3 NBS 53
9.101.4 NBES 54
10 Information to be given with enquiries, tenders and orders (informative) 55
10.1 General 55
10.2 Information with enquiries and orders 55
10.3 Information with tenders 56
11 Transport, storage, installation, operating instructions and maintenance 58
12 Safety 58
13 Influence of the product on the environment 58
Annex A (normative) Test requirements for component of DC transfer switches 59
A.1 Commutation switch 59
A.2 Making switch 59
A.3 Commutation capacitor 59
A.4 Energy dissipation device 60
A.5 Reactor 60
A.6 Charging device 60
A.6.1 Type tests for charging device 60
A.6.2 Routine test for charging device 61
Annex B (informative) Additional information about test circuit and measured signals for DC transfer switches having an oscillation branch 62
B.1 Test circuits for direct current transfer test 62
B.2 Test circuits for direct arc withstand test 64
Annex C (normative) Tolerances on test quantities during tests 66
Annex D (normative) Records and reports of type tests 69
D.1 Information and results to be recorded 69
D.2 Information to be included in type test reports 69
D.2.1 General 69
D.2.2 Apparatus tested 69
D.2.3 Rated characteristics of DC transfer switch, including its operating devices and auxiliary equipment 69
D.2.4 Test conditions (for each series of tests) 70
D.2.5 Direct current commutation tests 70
D.2.6 Direct arc withstand tests 70
D.2.7 Short-time withstand current test 70
D.2.8 No-load operation 71
D.2.9 Oscillographic and other records 71
Annex E (informative) Extension of validity of type tests 72

E.1 General 72
E.2 Dielectric tests 72
E.3 Continuous current test 72
E.4 Electromagnetic immunity test on auxiliary and control circuits 72
E.5 Environmental tests on auxiliary and control circuits 73
E.6 DC transfer current test 73
Bibliography 74

Figure 1 – Test sequence for low temperature test 37
Figure 2 – Test sequence for high temperature test 39
Figure 3 – Humidity test 41
Figure 4 – General layout of test circuit for direct current commutation test 44
Figure 5 – Current commutation test with low-frequency alternating current 45
Figure 6 – General layout of test circuit for direct arc withstand test 47
Figure 7 – Equivalent transfer circuit of MRTS and ERTS 53
Figure 8 – Equivalent transfer circuit of NBS 54
Figure 9 – Equivalent transfer circuit of NBES 55
Figure B.1 – Test circuit with measuring points 62
Figure B.2 – Measured signals during test (overview) 63
Figure B.3 – Measured signals during test (expanded in time) 64
Figure B.4 – Test circuit of direct arc withstand tests 65

Table 1 – Rated insulation levels for transfer switches 17
Table 2 – Nameplate information 21
Table 3 – Classification of commutation switches and making switches 24
Table 4 – Type tests 26
Table 5 – Number of operating sequences for commutation switches 34
Table 6 – Number of operating sequences for making switches 35
Table B.1 – Legend of measuring points 65
Table C.1 – Tolerances on test quantities for type test 66

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 315: Direct current (DC) transfer switches

FOREWORD

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IEC TS 62271-315 has been prepared by subcommittee 17A: Switching devices, of IEC technical committee 17: High-voltage switchgear and controlgear. It is a Technical Specification.

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

Draft	Report on voting
17A/1412/DTS	17A/1417/RVDTS

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 Specification 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.

This document is to be read in conjunction with IEC TS 62271-5:2024, to which it refers and which is applicable unless otherwise specified. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in IEC TS 62271-5. Amendments to these clauses and subclauses are given under the same references whilst additional subclauses are numbered from 101.

A list of all parts of IEC 62271 series, under the general title *High-voltage switchgear and controlgear* can be found on the IEC website.

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, or
- revised.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 315: Direct current (DC) transfer switches

1 Scope

This part of IEC 62271 is applicable to direct current (DC) transfer switches designed for indoor or outdoor installation and for operation on HVDC transmission systems having direct voltages of 100 kV and above.

DC transfer switches normally include metallic return transfer switches (MRTS), earth return transfer switches (ERTS), neutral bus switches (NBS) and neutral bus earthing switches (NBES).

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 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60071-11:2022, *Insulation co-ordination – Part 11: Definitions, principles and rules for HVDC system*

IEC 60076-6, *Power transformers– Part 6: Reactors*

IEC 60099-9, *Surge arresters – Part 9: Metal-oxide surge arresters without gaps for HVDC converter stations*

IEC 60255-21-1:1988, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section One: Vibration tests (sinusoidal)*

IEC 60270:2000, *High-voltage test techniques – Partial discharge measurements*

IEC 60633, *High-voltage direct current (HVDC) transmission – Vocabulary*

IEC 60871-1, *Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V – Part 1: General*

IEC 61000-4-18:2019, *Electromagnetic compatibility (EMC) – Part 4-18: Testing and measurement techniques – Damped oscillatory wave immunity test*

IEC TS 62271-5:2024, *High-voltage switchgear and controlgear – Part 5: Common specifications for direct current switchgear and controlgear*

IEC 62271-100:2021, *High-voltage switchgear and controlgear – Part 100: Alternating-current circuit-breakers*

IEC 62271-102:2018, *High-voltage switchgear and controlgear – Part 102: Alternating-current disconnectors and earthing switches*

IEC 62271-207, *High-voltage switchgear and controlgear – Part 207: Seismic qualification for gas-insulated switchgear assemblies for rated voltages above 52 kV*

IEC TS 63014-1, *High-voltage direct current (HVDC) power transmission – System requirements for DC-side equipment Part 1: Using line-commutated converters*