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This full version of IEC TS 62271-316:2024 includes the content of the references made to IEC TS 62271-5:2024

High-voltage switchgear and controlgear – Part 316: Direct current by-pass switches and paralleling switches

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CONTENTS

FOREWORD	7
INTRODUCTION to IEC TS 62271-5:2024	9
1 Scope	10
2 Normative references	10
3 Terms and definitions	13
3.1 General terms and definitions	13
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	23
3.6 Operational characteristics of switchgear and controlgear	28
3.7 Characteristic quantities	34
3.8 Index of definitions	41
4 Normal and special service conditions	45
4.1 Normal service conditions	45
4.2 Special service conditions	46
5 Ratings	48
5.1 General	48
5.2 Rated direct voltage (U_{rd})	49
5.3 Rated insulation level (U_{dd} , U_p , U_s)	50
5.4 Rated continuous current (I_{rd})	53
5.5 Rated values of short-time withstand current	54
5.6 Rated supply voltage of auxiliary and control circuits (U_a)	56
5.7 Rated supply frequency of auxiliary and control circuits	57
5.101 Rated commutation current	58
5.102 Rated operating sequence	58
6 Design and construction	58
6.1 Requirements for liquids in switchgear and controlgear	58
6.2 Requirements for gases in switchgear and controlgear	58
6.3 Earthing of switchgear and controlgear	58
6.4 Auxiliary and control equipment and circuits	59
6.5 Dependent power operation	63
6.6 Stored energy operation	63
6.7 Independent unlatched operation (independent manual or power operation)	64
6.8 Manually operated actuators	65
6.9 Operation of releases	65
6.10 Pressure/level indication	65
6.11 Nameplates	66
6.12 Locking devices	69
6.13 Position indication	69
6.14 Degrees of protection provided by enclosures	69
6.15 Creepage distances for outdoor insulators	70
6.16 Gas and vacuum tightness	70
6.17 Tightness for liquid systems	71
6.18 Fire hazard (flammability)	71

6.19	Electromagnetic compatibility (EMC)	71
6.20	X-ray emission	72
6.21	Corrosion	72
6.22	Filling levels for insulation, switching and/or operation	72
6.101	Design of BPSs and PSs	72
6.102	General requirement for operation	73
6.103	Pressure limits of fluids for operation	73
6.104	Time quantities	73
6.105	Static mechanical loads	74
7	Type tests	74
7.1	General	74
7.2	Dielectric tests	76
7.3	Resistance measurement	85
7.4	Continuous current tests	86
7.5	Short-time withstand current and peak withstand current tests	93
7.6	Verification of the protection	95
7.7	Tightness tests	96
7.8	Electromagnetic compatibility tests (EMC)	99
7.9	Additional tests on auxiliary and control circuits	105
7.10	X-radiation test for vacuum interrupters	108
7.101	Mechanical and environmental tests	110
7.102	Current commutation test	119
8	Routine tests	119
8.1	General	119
8.2	Dielectric test on the main circuit	120
8.3	Tests on auxiliary and control circuits	121
8.4	Measurement of the resistance of the main circuit	122
8.5	Tightness test	122
8.6	Design and visual checks	123
8.101	Mechanical operating tests	123
9	Guide to the selection of switchgear and controlgear (informative)	124
9.1	General	124
9.2	Selection of rated values	125
9.3	Cable-interface considerations	127
9.4	Continuous or temporary overload due to changed service conditions	127
9.5	Environmental aspects	127
10	Information to be given with enquiries, tenders and orders (informative)	128
10.1	General	128
10.2	Information with enquiries and orders	128
10.3	Information with tenders	130
11	Transport, storage, installation, operating instructions and maintenance	132
11.1	General	132
11.2	Conditions during transport, storage and installation	132
11.3	Installation	132
11.4	Operating instructions	140
11.5	Maintenance	140
11.101	Resistors and capacitors	143
12	Safety	143

12.1	General.....	143
12.2	Precautions by manufacturers.....	144
12.3	Precautions by users	144
13	Influence of the product on the environment	145
Annex A (informative) Examples of HVDC side switchgear arrangement for one pole in an HVDC substation		146
Annex B (informative) Exposure to pollution.....		148
B.1	General.....	148
B.2	Minimum requirements for switchgear in normal service condition.....	148
B.3	Minimum requirements for switchgear in special service condition	148
Annex C (informative) Preferred insulation levels for rated voltages lower than 105 kV.....		149
Annex D (informative) Short-circuit current in HVDC systems		150
D.1	VSC HVDC	150
D.2	LCC HVDC	151
D.3	Special case of LCC HVDC DC faults – LCC as diode bridge.....	151
D.4	HVDC systems with DC circuit-breakers.....	153
D.5	Calculation of the rated short-time withstand direct current	154
D.6	Calculation of Joule integral value (E_j)	155
Annex E (informative) References for auxiliary and control circuit components		156
Annex F (informative) List of symbols		158
Annex G (normative) Method for the weatherproofing test for outdoor switchgear and controlgear		160
Annex H (normative) Tolerances on test quantities during tests		163
Annex I (informative) Extension of validity of type tests.....		166
I.1	General.....	166
I.2	Dielectric tests	166
I.3	Short-time withstand current and peak withstand current tests	166
I.4	Electromagnetic immunity test on auxiliary and control circuits	166
I.5	Environmental tests on auxiliary and control circuits	166
Annex J (normative) Identification of test objects		168
J.1	General.....	168
J.2	Data.....	168
J.3	Drawings.....	168
Annex K (informative) Test circuit for superimposed impulse voltage tests.....		170
K.1	General.....	170
K.2	Test circuit using blocking capacitor.....	170
K.3	Test circuit using sphere gap	170
Annex L (informative) Information and technical requirements to be given with enquiries, tenders and orders		172
L.1	General.....	172
L.2	Normal and special service conditions (refer to Clause 4)	172
L.3	Ratings (refer to Clause 5).....	173
L.4	Design and construction (refer to Clause 6)	173
L.5	System information	174
L.6	Documentation for enquiries and tenders	174
Annex M (informative) Electromagnetic compatibility on site		175
Annex N (informative) Standardization activities of HVDC.....		176

Annex A (normative) Tolerances on test quantities during type tests.....	177
Annex B (normative) Records and reports of type tests.....	180
B.1 Information and results to be recorded.....	180
B.2 Information to be included in type test reports.....	180
Annex C (informative) Voltages associated with BPSs in different configurations.....	182
C.1 General.....	182
C.2 Case 1: BPS consisting of a single switching unit.....	182
C.3 Case 2: BPS consisting of two series connected switching units.....	184
Annex D (normative) Use of mechanical characteristics and related requirements.....	186
Bibliography.....	190
Figure 1 – Example of the location of BPSs in an HVDC transmission system.....	21
Figure 2 – Example of the location of a CPS in an HVDC transmission system.....	22
Figure 3 – Example of the location of a LPS in an HVDC transmission system.....	22
Figure 4 – BPS and PS – Opening and closing operations.....	36
Figure 5 – BPS and PS – Close-open cycle.....	37
Figure 6 – BPS and PS – Open-close cycle.....	38
Figure 1 – Schematic representation of superimposed impulse voltage tests.....	53
Figure 2 – Typical waveform of a short-circuit current in an HVDC system.....	55
Figure 3 – Examples of classes of contacts.....	63
Figure 7 – Example of two series connected BPSs.....	72
Figure 4 – Diagram of connections of a switching device.....	79
Figure 5 – Test sequence for polarity reversal tests.....	84
Figure 6 – Diagram of a test circuit for the radio interference voltage test.....	100
Figure 7 – Test location of radiation survey instrument.....	109
Figure 8 – Test sequence for low temperature test.....	114
Figure 9 – Test sequence for high temperature test.....	116
Figure 10 – Humidity test.....	118
Figure A.1 – Example of HVDC side switchgear arrangement for one pole in an HVDC substation.....	147
Figure D.1 – VSC HVDC under worst-case, pole-pole DC fault.....	150
Figure D.2 – LCC HVDC under worst-case, pole-pole DC fault.....	151
Figure D.3 – Special case LCC HVDC under worst-case, pole-pole DC fault.....	152
Figure D.4 – HVDC system with DC circuit-breaker under worst-case, pole-pole DC fault.....	153
Figure D.5 – DC circuit-breaker simple model.....	153
Figure D.6 – Equivalent fault current for calculation of rated short time withstand direct current.....	154
Figure G.1 – Arrangement for weatherproofing test.....	161
Figure G.2 – Nozzle for weatherproofing test.....	162
Figure K.1 – Test circuit for superimposed impulse tests using blocking capacitor.....	170
Figure K.2 – Test circuit for superimposed impulse tests using sphere gap.....	171
Figure C.1 – HVDC system with 3 series connected converter units per pole.....	182
Figure C.2 – Different ways to connect a BPS to the grid.....	183
Figure C.3 – HVDC system with 2 series connected converter units per pole.....	184

Figure D.1 – Example of reference mechanical characteristics (idealised curve).....	187
Figure D.2 – Reference mechanical characteristics of Figure D.1 with the envelopes centred over the reference curve (+5 %, –5 %)	187
Figure D.3 – Reference mechanical characteristics of Figure D.1 with the envelope fully displaced upward from the reference curve (+10 %, –0 %)	188
Figure D.4 – Reference mechanical characteristics of Figure D.1 with the envelope fully displaced downward from the reference curve (+0 %, –10 %)	189
Table 1 – Preferred rated insulation levels	51
Table 2 – Direct voltage of auxiliary and control circuits.....	57
Table 3 – Alternating voltage of auxiliary and control circuits	57
Table 4 – Auxiliary contact classes	62
Table 1 – Nameplate information	66
Table 5 – Nameplate information	68
Table 2 – Examples of static horizontal and vertical forces for static terminal load	74
Table 3 – Mandatory type tests	75
Table 6 – Test conditions in general case	79
Table 4 – Test conditions in general case for BPSs according to Alternative 1	80
Table 5 – Test conditions in general case for BPSs according to Alternative 2	81
Table 6 – Test conditions in general case for PSs	81
Table 7 – Test conditions in case of impulse voltage tests across the isolating distance (or open switching device)	81
Table 8 – Test conditions in case of superimposed impulse voltage tests	82
Table 9 – Test conditions for polarity reversal tests	84
Table 10 – Limits of temperature and temperature rise for various parts, materials and dielectrics of high-voltage switchgear and controlgear	90
Table 11 – Permissible leakage rates for gas systems	97
Table 12 – Application of voltages at the fast transient/burst test.....	103
Table 13 – Application of voltage at the damped oscillatory wave test.....	103
Table 14 – Assessment criteria for transient disturbance immunity.....	104
Table 7 – Number of operating sequences	113
Table C.1 – Preferred insulation levels for rated voltages lower than 105 kV.....	149
Table E.1 – List of reference documents for auxiliary and control circuit components.....	156
Table H.1 – Tolerances on test quantities for type test.....	163
Table J.1 Drawing list and contents	168
Table A.1 – Tolerances on test quantities for type tests	178
Table C.1 – Voltage across the post insulator	184

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 316: Direct current by-pass switches and paralleling switches

FOREWORD

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IEC TS 62271-316:2024 EXV includes the content of IEC TS 62271-316:2024, and the references made to IEC TS 62271-5:2024.

The specific content of IEC TS 62271-316:2024 is displayed on a [blue background](#).

IEC TS 62271-316 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/1407/DTS	17A/1414/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 shall be read in conjunction with IEC TS 62271-5:2024, to which it refers, and which is applicable unless otherwise specified in this document. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in IEC TS 62271-5. Modifications to these clauses and subclauses are given under the same references whilst additional subclauses are numbered from 101.

A list of all parts in the IEC 62271 series, published 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.

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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 316: Direct current by-pass switches and paralleling switches

1 Scope

This part of IEC 62271, which is a Technical Specification, is applicable to direct current (DC) by-pass switches (BPS) and paralleling switches (PS) designed for indoor or outdoor installation and for operation on HVDC transmission systems having direct voltages of 100 kV and above.

Switches other than mechanical switching devices used for the same applications specified here are not covered by this document.

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 60050-151, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*, (available at www.electropedia.org)

IEC 60050-441, *International Electrotechnical Vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses*, (available at www.electropedia.org)

IEC 60050-442, *International Electrotechnical Vocabulary (IEV) – Part 442: Electrical accessories*, (available at www.electropedia.org)

IEC 60050-461, *International Electrotechnical Vocabulary (IEV) – Part 461: Electric cables*, (available at www.electropedia.org)

IEC 60050-601, *International Electrotechnical Vocabulary (IEV) – Part 601: Generation, transmission and distribution of electricity – General*, (available at www.electropedia.org)

IEC 60050-614, *International Electrotechnical Vocabulary – Part 614: Generation, transmission and distribution of electricity – Operation*, (available at www.electropedia.org)

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, *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 coordination – Part 11: Definitions, principles and rules for HVDC system*

IEC 60071-12:2022, *Insulation coordination – Part 12: Application guidelines for LCC HVDC converter stations*

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

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, *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 (SF₆) 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 (SF₆) 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 60633:2019, *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 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, *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*

IEC 62271-102:2018, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*
IEC 62271-102:2018/AMD1:2022

IEC TS 62271-315:2024, *High-voltage switchgear and controlgear – Part 315: Direct current (DC) transfer switches*

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*

This is a preview of IEC/TS 62271-316 Ed. 1.0 en:2024 EXV. [Click here to purchase the full version from the ANSI](#)

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*



TECHNICAL SPECIFICATION

High-voltage switchgear and controlgear – Part 316: Direct current by-pass switches and paralleling switches



CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
3.1 General terms and definitions	8
3.2 Assemblies of switchgear and controlgear	9
3.3 Parts of assemblies	9
3.4 Switching devices	9
3.5 Parts of switchgear and controlgear	11
3.6 Operational characteristics of switchgear and controlgear.....	13
3.7 Characteristic quantities	15
3.8 Index of definitions.....	20
4 Normal and special service conditions	22
5 Ratings.....	22
5.1 General.....	22
5.2 Rated direct voltage (U_{rd}).....	23
5.3 Rated insulation level (U_{dd} , U_p , U_s)	24
5.4 Rated continuous current (I_{rd})	24
5.5 Rated values of short-time withstand current.....	24
5.6 Rated supply voltage of auxiliary and control circuits (U_a)	24
5.7 Rated supply frequency of auxiliary and control circuits	24
5.8 Rated pressure of compressed gas supply for controlled pressure systems	24
5.101 Rated commutation current	25
5.102 Rated operating sequence	25
6 Design and construction	25
6.1 Requirements for liquids in switchgear and controlgear.....	25
6.2 Requirements for gases in switchgear and controlgear	25
6.3 Earthing of switchgear and controlgear	25
6.4 Auxiliary and control equipment and circuits	25
6.5 Dependent power operation	26
6.6 Stored energy operation.....	26
6.7 Independent unlatched operation (independent manual or power operation)	26
6.8 Manually operated actuators	26
6.9 Operation of releases.....	26
6.10 Pressure/level indication	26
6.11 Nameplates.....	26
6.12 Locking devices	28
6.13 Position indication.....	28
6.14 Degrees of protection provided by enclosures.....	28
6.15 Creepage distances for outdoor insulators	28
6.16 Gas and vacuum tightness	28
6.17 Tightness for liquid systems.....	28
6.18 Fire hazard (flammability)	28
6.19 Electromagnetic compatibility (EMC).....	28
6.20 X-ray emission	28
6.21 Corrosion	28

6.22	Filling levels for insulation, switching and/or operation	28
6.101	Design of BPSs and PSs	29
6.102	General requirement for operation	29
6.103	Pressure limits of fluids for operation	30
6.104	Time quantities	30
6.105	Static mechanical loads	30
7	Type tests	31
7.1	General	31
7.2	Dielectric tests	32
7.3	Resistance measurement	35
7.4	Continuous current tests	35
7.5	Short-time withstand current and peak withstand current tests	36
7.6	Verification of the protection	36
7.7	Tightness tests	36
7.8	Electromagnetic compatibility tests (EMC)	36
7.9	Additional tests on auxiliary and control circuits	37
7.10	X-radiation test procedure for vacuum interrupters	38
7.101	Mechanical and environmental tests	38
7.102	Current commutation test	47
8	Routine tests	47
8.1	General	47
8.2	Dielectric test on the main circuit	47
8.3	Tests on auxiliary and control circuits	48
8.4	Measurement of the resistance of the main circuit	48
8.5	Tightness test	48
8.6	Design and visual checks	48
8.101	Mechanical operating tests	48
9	Guide to the selection of switchgear and controlgear (informative)	50
9.1	General	50
9.2	Selection of rated values	50
9.3	Cable-interface connections	52
9.4	Continuous or temporary overload due to changed service conditions	52
9.5	Environmental aspects	53
10	Information to be given with enquiries, tenders and orders (informative)	53
10.1	General	53
10.2	Information with enquiries and orders	53
10.3	Information to be given with tenders	54
11	Transport, storage, installation, operation instructions and maintenance	55
11.1	General	55
11.2	Conditions during transport, storage and installation	55
11.3	Installation	55
11.4	Operating instructions	61
11.5	Maintenance	61
11.101	Resistors and capacitors	61
12	Safety	61
13	Influence of the product on the environment	61
Annex A (normative)	Tolerances on test quantities during type tests	62
Annex B (normative)	Records and reports of type tests	65

B.1	Information and results to be recorded	65
B.2	Information to be included in type test reports	65
Annex C (informative)	Voltages associated with BPSs in different configurations	67
C.1	General.....	67
C.2	Case 1: BPS consisting of a single switching unit.....	67
C.3	Case 2: BPS consisting of two series connected switching units	69
Annex D (normative)	Use of mechanical characteristics and related requirements	71
Bibliography	75
Figure 1	– Example of the location of BPSs in an HVDC transmission system.....	10
Figure 2	– Example of the location of a CPS in an HVDC transmission system	11
Figure 3	– Example of the location of a LPS in an HVDC transmission system.....	11
Figure 4	– BPS and PS – Opening and closing operations	15
Figure 5	– BPS and PS – Close-open cycle	16
Figure 6	– BPS and PS – Open-close cycle	17
Figure 7	– Example of two series connected BPSs.....	29
Figure 8	– Test sequence for low temperature test.....	42
Figure 9	– Test sequence for high temperature test	44
Figure 10	– Humidity test	46
Figure C.1	– HVDC system with 3 series connected converter units per pole	67
Figure C.2	– Different ways to connect a BPS to the grid	68
Figure C.3	– HVDC system with 2 series connected converter units per pole	70
Figure D.1	– Example of reference mechanical characteristics (idealised curve).....	72
Figure D.2	– Reference mechanical characteristics of Figure D.1 with the envelopes centred over the reference curve (+5 %, –5 %)	72
Figure D.3	– Reference mechanical characteristics of Figure D.1 with the envelope fully displaced upward from the reference curve (+10 %, –0 %)	73
Figure D.4	– Reference mechanical characteristics of Figure D.1 with the envelope fully displaced downward from the reference curve (+0 %, –10 %)	74
Table 1	– Nameplate information	27
Table 2	– Examples of static horizontal and vertical forces for static terminal load	30
Table 3	– Mandatory type tests	31
Table 4	– Test conditions in general case for BPSs according to Alternative 1	33
Table 5	– Test conditions in general case for BPSs according to Alternative 2	34
Table 6	– Test conditions in general case for PSs.....	34
Table 7	– Number of operating sequences	40
Table A.1	– Tolerances on test quantities for type tests	63
Table C.1	– Voltage across the post insulator	69

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 316: Direct current by-pass switches and paralleling switches

FOREWORD

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IEC TS 62271-316 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:

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

A list of all parts in the IEC 62271 series, published 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 316: Direct current by-pass switches and paralleling switches

1 Scope

This part of IEC 62271, which is a Technical Specification, is applicable to direct current (DC) by-pass switches (BPS) and paralleling switches (PS) designed for indoor or outdoor installation and for operation on HVDC transmission systems having direct voltages of 100 kV and above.

Switches other than mechanical switching devices used for the same applications specified here are not covered by this document.

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 60050-151, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*, (available at www.electropedia.org)

IEC 60050-441, *International Electrotechnical Vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses*, (available at www.electropedia.org)

IEC 60050-442, *International Electrotechnical Vocabulary (IEV) – Part 442: Electrical accessories*, (available at www.electropedia.org)

IEC 60050-461, *International Electrotechnical Vocabulary (IEV) – Part 461: Electric cables*, (available at www.electropedia.org)

IEC 60050-601, *International Electrotechnical Vocabulary (IEV) – Part 601: Generation, transmission and distribution of electricity – General*, (available at www.electropedia.org)

IEC 60050-614, *International Electrotechnical Vocabulary – Part 614: Generation, transmission and distribution of electricity – Operation*, (available at www.electropedia.org)

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

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

IEC 60071-12:2022, *Insulation coordination – Part 12: Application guidelines for LCC HVDC converter stations*

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

IEC 60376, *Specification of technical grade sulphur hexafluoride (SF₆) and complementary gases to be used in its mixtures for use in electrical equipment*

IEC 60480, *Specifications for the re-use of sulphur hexafluoride (SF₆) and its mixtures in electrical equipment*

IEC 60633:2019, *High-voltage direct current (HVDC) transmission – Vocabulary*

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

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

IEC 62271-102:2018/AMD1:2022

IEC TS 62271-315:2024, *High-voltage switchgear and controlgear – Part 315: Direct current (DC) transfer switches*