

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**High-voltage switchgear and controlgear –
Part 1: Common specifications for alternating current switchgear and
controlgear**

**Appareillage à haute tension –
Partie 1: Spécifications communes pour appareillage à courant alternatif**



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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

**Part 1: Common specifications for alternating
current switchgear and controlgear**

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by IEC technical committee 17: High-voltage switchgear and controlgear.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
17/1090/DISH	17/1095/RVDISH

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

Interpretation of 4.2.2 of IEC 62271-1:2017 regarding the altitude correction factor

Subclause 4.2.2 of IEC 62271-1:2017 contains two references for calculation of the required insulation withstand level at altitudes higher than 1 000 m, IEC 60071-2:1996 and IEC TR 62271-306. The two references are in conflict, as the altitude correction factor according to IEC 60071-2:1996 starts at sea level and that of IEC TR 62271-306 starts at an altitude of 1 000 m. This results in different altitude correction factors.

As already stated in 5.3 of IEC 62271-1:2017, the rated insulation levels refer to normal service conditions. Altitudes up to 1 000 m above sea level are covered and need no altitude correction.

For altitudes higher than 1 000 m the equation provided in 4.5.1.1 b) of IEC TR 62271-306:2012 and in H.3.4 of IEC 60071-2:2018 shall be used, i.e.

$$k_{\text{alt}} = e^{m \left(\frac{H-1000}{8150} \right)}$$

where

k_{alt} is the altitude correction factor;

H is the altitude in m above sea level;

m is an exponent.

Conservative values for the exponent m are provided in Table 4 of IEC TR 62271-306:2012. For further details about the exponent m , see H.4 of IEC 60071-2:2018.

CONTENTS

FOREWORD.....	8
INTRODUCTION.....	11
1 Scope.....	12
2 Normative references.....	12
3 Terms and definitions	14
3.1 General terms and definitions	15
3.2 Assemblies of switchgear and controlgear	18
3.3 Parts of assemblies.....	18
3.4 Switching devices	18
3.5 Parts of switchgear and controlgear.....	18
3.6 Operational characteristics of switchgear and controlgear	22
3.6.5 Terms and definitions relative to pressure (or density)	23
3.6.6 Terms and definitions relating to gas and vacuum tightness	23
3.6.7 Terms and definitions relating to liquid tightness.....	25
3.7 Characteristic quantities	25
3.8 Index of definitions	26
4 Normal and special service conditions.....	28
4.1 Normal service conditions	28
4.1.1 General	28
4.1.2 Indoor switchgear and controlgear	28
4.1.3 Outdoor switchgear and controlgear	29
4.2 Special service conditions	29
4.2.1 General	29
4.2.2 Altitude	29
4.2.3 Exposure to pollution	30
4.2.4 Temperature and humidity.....	30
4.2.5 Exposure to abnormal vibrations, shock or tilting	30
4.2.6 Wind speed.....	31
4.2.7 Other parameters	31
5 Ratings.....	31
5.1 General.....	31
5.2 Rated voltage (U_r).....	31
5.2.1 General	31
5.2.2 Range I for rated voltages of 245 kV and below	31
5.2.3 Range II for rated voltages above 245 kV	32
5.3 Rated insulation level (U_d , U_p , U_s)	32
5.4 Rated frequency (f_r)	36
5.5 Rated continuous current (I_r).....	36
5.6 Rated short-time withstand current (I_k)	36
5.7 Rated peak withstand current (I_p).....	37
5.8 Rated duration of short-circuit (t_k)	37
5.9 Rated supply voltage of auxiliary and control circuits (U_a).....	37
5.9.1 General	37
5.9.2 Rated supply voltage (U_a)	37
5.10 Rated supply frequency of auxiliary and control circuits.....	38
5.11 Rated pressure of compressed gas supply for controlled pressure systems	38

6	Design and construction	39
6.1	Requirements for liquids in switchgear and controlgear	39
6.2	Requirements for gases in switchgear and controlgear	39
6.3	Earthing of switchgear and controlgear	39
6.4	Auxiliary and control equipment and circuits	39
6.4.1	General	39
6.4.2	Protection against electric shock	40
6.4.3	Components installed in enclosures	41
6.5	Dependent power operation	44
6.6	Stored energy operation	44
6.6.1	General	44
6.6.2	Energy storage in gas receivers or hydraulic accumulators	44
6.6.3	Energy storage in springs (or weights)	44
6.6.4	Manual charging	44
6.6.5	Motor charging	45
6.6.6	Energy storage in capacitors	45
6.7	Independent unlatched operation (independent manual or power operation)	45
6.8	Manually operated actuators	45
6.9	Operation of releases	46
6.9.1	General	46
6.9.2	Shunt closing release	46
6.9.3	Shunt opening release	46
6.9.4	Capacitor operation of shunt releases	46
6.9.5	Under-voltage release	46
6.10	Pressure/level indication	46
6.10.1	Gas pressure	46
6.10.2	Liquid level	47
6.11	Nameplates	47
6.11.1	General	47
6.11.2	Application	47
6.12	Locking devices	48
6.13	Position indication	49
6.14	Degrees of protection provided by enclosures	49
6.14.1	General	49
6.14.2	Protection of persons against access to hazardous parts and protection of the equipment against ingress of solid foreign objects (IP coding)	49
6.14.3	Protection against ingress of water (IP coding)	49
6.14.4	Protection against mechanical impact under normal service conditions (IK coding)	49
6.15	Creepage distances for outdoor insulators	49
6.16	Gas and vacuum tightness	50
6.16.1	General	50
6.16.2	Controlled pressure systems for gas	50
6.16.3	Closed pressure systems for gas	50
6.16.4	Sealed pressure systems	50
6.17	Tightness for liquid systems	51
6.17.1	General	51
6.17.2	Leakage rates	51
6.18	Fire hazard (flammability)	51

6.19	Electromagnetic compatibility (EMC).....	51
6.20	X-ray emission	51
6.21	Corrosion	51
6.22	Filling levels for insulation, switching and/or operation	52
7	Type tests	52
7.1	General.....	52
7.1.1	Basics	52
7.1.2	Information for identification of test objects.....	52
7.1.3	Information to be included in type-test reports	52
7.2	Dielectric tests	53
7.2.1	General	53
7.2.2	Ambient air conditions during tests	53
7.2.3	Wet test procedure.....	54
7.2.4	Arrangement of the equipment	54
7.2.5	Criteria to pass the test.....	54
7.2.6	Application of the test voltage and test conditions.....	55
7.2.7	Tests of switchgear and controlgear of $U_r \leq 245$ kV	59
7.2.8	Tests of switchgear and controlgear of $U_r > 245$ kV	59
7.2.9	Artificial pollution tests for outdoor insulators.....	60
7.2.10	Partial discharge tests.....	60
7.2.11	Dielectric tests on auxiliary and control circuits.....	60
7.2.12	Voltage test as condition check	60
7.3	Radio interference voltage (RIV) test	61
7.4	Resistance measurement	61
7.4.1	Measurement of the resistance of auxiliary contacts class 1 and class 2	61
7.4.2	Measurement of the resistance of auxiliary contacts class 3.....	61
7.4.3	Electrical continuity of earthed metallic parts test.....	61
7.4.4	Resistance measurement of contacts and connections in the main circuit as a condition check	61
7.5	Continuous current tests.....	62
7.5.1	Condition of the test object.....	62
7.5.2	Arrangement of the equipment	62
7.5.3	Test current and duration	63
7.5.4	Temperature measurement during test	64
7.5.5	Resistance of the main circuit.....	65
7.5.6	Criteria to pass test.....	65
7.6	Short-time withstand current and peak withstand current tests	69
7.6.1	General	69
7.6.2	Arrangement of the equipment and of the test circuit.....	69
7.6.3	Test current and duration	70
7.6.4	Conditions of the test object after test.....	71
7.7	Verification of the protection.....	71
7.7.1	Verification of the IP coding.....	71
7.7.2	Verification of the IK coding.....	71
7.8	Tightness tests.....	72
7.8.1	General	72
7.8.2	Controlled pressure systems for gas.....	73
7.8.3	Closed pressure systems for gas.....	73
7.8.4	Sealed pressure systems	74

7.8.5	Liquid tightness tests	74
7.9	Electromagnetic compatibility tests (EMC)	74
7.9.1	Emission tests	74
7.9.2	Immunity tests on auxiliary and control circuits	77
7.9.3	Additional EMC tests on auxiliary and control circuits.....	79
7.10	Additional tests on auxiliary and control circuits	80
7.10.1	General	80
7.10.2	Functional tests	80
7.10.3	Verification of the operational characteristics of auxiliary contacts.....	80
7.10.4	Environmental tests	81
7.10.5	Dielectric test.....	82
7.11	X-radiation test for vacuum interrupters	82
7.11.1	General requirements.....	82
7.11.2	Test voltage and measurement procedure	84
7.11.3	Acceptance criteria	84
8	Routine tests	85
8.1	General.....	85
8.2	Dielectric test on the main circuit.....	85
8.3	Tests on auxiliary and control circuits	86
8.3.1	Inspection of auxiliary and control circuits, and verification of conformity to the circuit diagrams and wiring diagrams	86
8.3.2	Functional tests	86
8.3.3	Verification of protection against electrical shock	86
8.3.4	Dielectric tests	86
8.4	Measurement of the resistance of the main circuit.....	86
8.5	Tightness test	87
8.5.1	General	87
8.5.2	Controlled pressure systems for gas.....	87
8.5.3	Closed pressure systems for gas.....	87
8.5.4	Sealed pressure systems	87
8.5.5	Liquid tightness tests	87
8.6	Design and visual checks	87
9	Guide to the selection of switchgear and controlgear (informative).....	88
9.1	General.....	88
9.2	Selection of rated values	88
9.3	Cable-interface considerations	88
9.4	Continuous or temporary overload due to changed service conditions	88
9.5	Environmental aspects	88
9.5.1	Service conditions.....	88
9.5.2	Clearances affected by service conditions	88
9.5.3	High humidity.....	88
9.5.4	Solar radiation	89
10	Information to be given with enquiries, tenders and orders (informative)	89
10.1	General.....	89
10.2	Information with enquiries and orders	89
10.3	Information with tenders	90
11	Transport, storage, installation, operating instructions and maintenance	91
11.1	General.....	91
11.2	Conditions during transport, storage and installation	91

11.3	Installation	91
11.3.1	General	91
11.3.2	Unpacking and lifting.....	91
11.3.3	Assembly.....	92
11.3.4	Mounting.....	92
11.3.5	Connections.....	92
11.3.6	Information about gas and gas mixtures for controlled and closed pressure systems.....	92
11.3.7	Final installation inspection	93
11.3.8	Basic input data by the user	93
11.3.9	Basic input data by the manufacturer	93
11.4	Operating instructions	94
11.5	Maintenance	94
11.5.1	General	94
11.5.2	Information about fluids and gas to be included in maintenance manual	94
11.5.3	Recommendations for the manufacturer.....	94
11.5.4	Recommendations for the user	95
11.5.5	Failure report	96
12	Safety	97
12.1	General.....	97
12.2	Precautions by manufacturers	98
12.3	Precautions by users.....	98
13	Influence of the product on the environment.....	98
Annex A	(normative) Identification of test objects	100
A.1	General.....	100
A.2	Data	100
A.3	Drawings.....	100
Annex B	(informative) Determination of the equivalent RMS value of a short-time current during a short-circuit of a given duration	102
Annex C	(normative) Method for the weatherproofing test for outdoor switchgear and controlgear	103
Annex D	(informative) References for auxiliary and control circuit components.....	106
Annex E	(normative) Tolerances on test quantities during tests.....	108
Annex F	(informative) Information and technical requirements to be given with enquiries, tenders and orders.....	111
F.1	General.....	111
F.2	Normal and special service conditions (refer to Clause 4)	111
F.3	Ratings (refer to Clause 5)	112
F.4	Design and construction (refer to Clause 6)	112
F.5	System information	113
F.6	Documentation for enquiries and tenders	113
Annex G	(informative) List of symbols	114
Annex H	(informative) Electromagnetic compatibility on site.....	115
Annex I	(informative) List of notes concerning certain countries	116
Annex J	(informative) Extension of validity of type tests.....	117
J.1	General.....	117
J.2	Dielectric tests	117
J.3	Short-time withstand current tests.....	117

J.4	Continuous current test	117
J.5	Electromagnetic immunity test on auxiliary and control circuits	118
J.6	Environmental tests on auxiliary and control circuits	118
Annex K (informative)	Exposure to pollution	119
K.1	General.....	119
K.2	Pollution levels.....	119
K.3	Minimum requirements for switchgear.....	119
Bibliography	121
Figure 1	– Examples of classes of contacts	43
Figure 2	– Diagram of connections of a three-pole switching device	56
Figure 3	– Diagram of a test circuit for the radio interference voltage test.....	75
Figure 4	– Test location of radiation survey instrument	84
Figure B.1	– Determination of short-time current.....	102
Figure C.1	– Arrangement for weatherproofing test.....	104
Figure C.2	– Nozzle for weatherproofing test.....	105
Table 1	– Rated insulation levels for rated voltages of range I, series I	33
Table 2	– Rated insulation levels for rated voltages of range I, series II (based on current practice in some countries, including US)	34
Table 3	– Rated insulation levels for rated voltages of range II.....	35
Table 4	– Additional rated insulation levels for range II, based on current practice in some countries, including US	36
Table 5	– Peak factors for rated peak withstand current.....	37
Table 6	– Direct current voltage	38
Table 7	– Alternating current voltage	38
Table 8	– Auxiliary contact classes.....	43
Table 9	– Nameplate information.....	48
Table 10	– Test conditions in general case	56
Table 11	– Power-frequency test conditions	57
Table 12	– Impulse test conditions	58
Table 13	– Test conditions for the alternative method	58
Table 14	– Limits of temperature and temperature rise for various parts, materials and dielectrics of high-voltage switchgear and controlgear	66
Table 15	– Permissible leakage rates for gas systems	73
Table 16	– Application of voltages at the fast transient/burst test	78
Table 17	– Application of voltage at the damped oscillatory wave test.....	78
Table 18	– Assessment criteria for transient disturbance immunity.....	79
Table D.1	– List of reference documents for auxiliary and control circuit components	106
Table E.1	– Tolerances on test quantities for type test.....	109
Table K.1	– Environmental examples by site pollution severity (SPS) class	120
Table K.2	– Minimum nominal specific creepage distance by pollution level	120

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –**Part 1: Common specifications for alternating
current switchgear and controlgear**

FOREWORD

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IEC 62271-1 edition 2.1 contains the second edition (2017-07) [documents 17/1033/FDIS and 17/1037/RVD], its interpretation sheet 1 (2021-05) and its amendment 1 (2021-10) [documents 17/1106/FDIS and 17/1112/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 62271-1 has been prepared by technical committee 17: High-voltage switchgear and controlgear.

This second edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

New numbering in accordance with ISO/IEC directives, Part 2 (2016) and IEEE Std. C37.100.1.

4.1.2 a) The normal service condition for indoor switchgear is limited to one range of 40 °C to –5 °C.

4.1.3 a) The normal service condition for outdoor switchgear is limited to one range of 40 °C to –25 °C.

4.2.2: The specifications from IEC 60071-2:1996 are adopted for altitude correction factors above 1 000 m.

5.2.2: Range I, the rated voltage of 40,5 kV is added Series I Table 1; Table 2 and Table 4 are updated on recommendation of the US National Committee.

6.8: New subclause added for manual operated actuators consistent with “Man Machine Interface” recommendations of IEC 60447 [1] 1.

7.2.6.1: Insert the wording regarding preliminary impulses across open vacuum interrupters according to the result of IEC 17/1026/RQ.

7.3: Changed the requirement for radio interference voltage to a rated voltage level of 245 kV and above, instead of 123 kV and above. This change is based on reported positive test and service experience of utility representatives in the maintenance team of this standard.

7.5.6, Table 14:

a) Introduced the distinction of parts in “OG” (oxidizing gas) or in “NOG” (not oxidizing gas) replacing the former “air” and “SF₆”;

b) Increased the allowable temperature rise for some parts in groups 1 and 2 of Table 14 according to IEC TR 60943 [2];

c) Expanded the definition of allowable temperature rise for categories of accessible surfaces with reference to IEC Guide 117 [3]. See also point 15 in 7.5.6.2.

7.5.6.2: Point 5 is modified to clarify the introduction of “OG” and “NOG” gas.

7.10: Some tests were removed because the relevant test standards of IEC 60068 series were modified or withdrawn.

7.11.3: The acceptance criteria for X-radiation testing are modified to recognize higher rated vacuum interrupters.

Former informative Annex H: Corrosion is deleted, the content is part of IEC TR 62271-306 [4].

New Annex J (informative): Added informative guidelines for the extension of validity of type tests

New Annex K (informative): Added informative guidelines about exposure to pollution

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

¹ Numbers in square brackets refer to the Bibliography.

The reader's attention is drawn to the fact that Annex I lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this standard.

The list of all parts of the 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 the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under webstore.iec.ch in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
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INTRODUCTION

In the preparation of this FDIS draft for the general revision of IEC 62271-1:2007 and IEC 62271-1:2007/AMD1:2011, the maintenance team was motivated by the following principles:

- Application of horizontal standards – such application is mandatory for product standards, (reference IEC Guide 108 [5]). A typical example is the application of IEC 60071 (all parts) dealing with insulation coordination.
- Application of the "principle of verifiability" – as defined in the Directives, Part 2, 5.5 (2016) "...Only those requirements which can be verified shall be included."
- Organizing information in the proper clause, e.g. terms and definitions in Clause 3, rated values in Clause 5. For example, the values of rated continuous current are specified in Clause 5 but the conditions of test and acceptance criteria (e.g. temperature rise limits) are moved to Clause 7.
- Normal service conditions in Clause 4 are unambiguous statements of conditions under which the switchgear and controlgear is expected to operate. For example: "Solar radiation does not exceed a level of 1 000 W/m²" rather than "Solar radiation up to a level of 1 000 W/m² should be considered".
- Ratings in Clause 5 have been limited to reflect the common specifications of the switchgear and controlgear that are specified by the user and are necessary for operation on the user's network. See the last paragraph of 5.1 for addition clarification.
- Statements or informative NOTES that reflect design guides (not requirements) or application (not standard requirements) are either removed or moved to Clause 9.
For example, the following former NOTE contains both a design guide and an application issue, neither of which belongs to normal service conditions:
"Under certain levels of solar radiation, appropriate measures, for example roofing, forced ventilation, test simulating solar gain, etc., may be necessary, or derating may be used, in order not to exceed the specified temperature rises and pressure rise limits".
- Specifications for design and construction in Clause 6 have been limited to requirements that can be verified by test or inspection.
- References to tests and procedures that relate to transportation, installation, commissioning and maintenance have been moved to Clause 11.
- Improve wording to minimize the possibility of miss-interpretation or conflicting interpretations of the specifications, methods or criteria.
- Elimination of hanging paragraphs and actual or potential circular references. Reference to ISO/IEC Directives, Part 2, 22.3.3 (2016).

As a result of the application of these principles or objectives, the FDIS draft includes more revisions that might otherwise be expected.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 1: Common specifications for alternating current switchgear and controlgear

1 Scope

This part of IEC 62271 applies to AC switchgear and controlgear designed for indoor and/or outdoor installation and for operation at service frequencies up to and including 60 Hz and having rated voltages above 1 000 V.

This document applies to all high-voltage switchgear and controlgear except as otherwise specified in the relevant IEC standards for the particular type of switchgear and controlgear.

NOTE For the use of this document, high-voltage is defined as the rated voltage above 1 000 V. However, the term medium voltage is commonly used for distribution systems with voltages above 1 kV and generally applied up to and including 52 kV.

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 60050-131:2002, *International Electrotechnical Vocabulary (IEV) – Part 131: Circuit theory*

IEC 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

IEC 60050-192:2015, *International Electrotechnical Vocabulary (IEV) – Part 192: Dependability*

IEC 60050-351, *International Electrotechnical Vocabulary (IEV) – Part 351: Control technology*

IEC 60050-441:1984, *International Electrotechnical Vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses*
IEC 60050-441:1984/AMD1:2000

IEC 60050-551, *International Electrotechnical Vocabulary (IEV) – Part 551: Power electronics*

IEC 60050-581:2008, *International Electrotechnical Vocabulary (IEV) – Part 581: Electromechanical components for electronic equipment*

IEC 60050-601, *International Electrotechnical Vocabulary (IEV) – Chapter 601: Generation, transmission and distribution of electricity – General*

IEC 60050-605, *International Electrotechnical Vocabulary (IEV) – Chapter 605: Generation, transmission and distribution of electricity – Substations*