IEC/TS 62271-304

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TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

High-voltage switchgear and controlgear –
Part 304: Design classes for indoor enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 52 kV to be used in severe climatic conditions

Appareillage à haute tension –
Partie 304: Classes de construction pour l'appareillage d'intérieur sous enveloppe pour tensions assignées à partir de 1 kV jusqu'à 52 kV inclus pour usage sous conditions climatiques sévères

IEC/TS 62271-304:2008

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62771-304, which is a technical specification, has been prepared by subcommittee 17C: High-voltage switchgear and controlgear assemblies, of IEC technical committee 17: Switchgear and controlgear.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
17C/402/DTS	17C/422A/RVC

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

This first edition of IEC/TS 62271-304 cancels and replaces the first edition of IEC/TR 60932, published in 1988, and constitutes a technical revision.

This revised document has been basically changed to be updated to today's use of high-voltage switchgear and controlgear up to 52 kV.

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

A list of all the parts in 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 this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of January 2010 have been included in this copy.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 304: Design classes for indoor enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 52 kV to be used in severe climatic conditions

1 Scope and object

This part of IEC 62271 applies to indoor enclosed switchgear and controlgear complying with IEC 62271-200 and IEC 62271-201, intended to be used in service conditions more severe with respect to condensation and pollution than the normal service conditions specified in IEC 62271-1.

This technical specification covers equipment where any of the insulation is exposed to indoor climatic conditions.

The test detailed in this technical specification has been designed primarily to investigate the behaviour of electrical insulation and not corrosion on equipments. Nevertheless, the performance of mechanical components, such as mechanisms, interlocks and enclosures may also be recorded.

This technical specification proposes definitions for two degrees of severe service conditions with respect to condensation and pollution. It also proposes test procedures for assessing the performance of enclosed switchgear and controlgear under specified conditions so that conclusions may be drawn concerning their suitability for service under those severe service conditions.

In this technical specification, the term "equipment" is used in accordance with the scope for an "enclosed assembly of switchgear and controlgear" (see IEC 60050-441, definition 441-12-02).

NOTE The testing procedures described in this technical specification may also be applied to internal insulation of outdoor equipment.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60068 (all parts), *Environmental testing*

IEC 62271-1:2007, *High-voltage switchgear and controlgear – Part 1: Common specifications*

IEC 62271-200, *High-voltage switchgear and controlgear – Part 200: A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

IEC 62271-201, *High-voltage switchgear and controlgear – Part 201: AC insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

3 Degrees of severity of service conditions under condensation and pollution

Indoor equipment installed inside a building or room and thus normally protected against the outdoor climatic conditions may be subjected to condensation due to rapid temperature changes and to pollution due to the environment inside the building.

The service conditions with respect to condensation and pollution around the enclosed switchgear and controlgear are designated and characterized as follows:

C_o: Condensation does not normally occur (not more than twice a year)

- Equipment to be used in locations with humidity and/or temperature control in order to avoid condensation. The building or room provides protection from daily variations of outside climate.

C_L: Non-frequent condensation (not more than twice a month)

- Equipment to be used in locations without humidity and/or temperature control. The building or room provides protection from daily variations of outside climate, but condensation cannot be excluded.

C_H: Frequent condensation (more than twice a month)

- Equipment to be used in locations without temperature control. The building or room provides only minimal protection from daily variations of outside climate, so that frequent condensation may occur.

P_L: Light pollution (as given in 2.1.1, item d) of IEC 62271-1) (see note 2 below)

- In order to reach light pollution in heavy polluted locations precautions may be necessary.

P_H: Heavy pollution (any value exceeding P_L)
P_H does not include areas subject to conductive dust and/or to industrial smoke, producing thick conductive deposits.

- The location has no special precautions to minimize the presence of deposits, or the equipment is situated in close proximity to pollution sources.

NOTE 1 Absence of pollution is considered as unrealistic. At least light pollution is assumed.

NOTE 2 IEC 62271-1, 2.1.1, item d): "The ambient air is not significantly polluted by dust, smoke, corrosive and/or flammable gases, vapours or salt. The manufacturer will assume that, in absence of specific requirements from the user, there are none."

NOTE 3 Precautions to minimize the amount of deposits inside the enclosure of the equipment may be taken by the choice of an appropriate degree of protection of the enclosed switchgear and controlgear.

Taking into account the fact that the equipment is especially influenced by the combination of humidity and pollution, three degrees of severity of service conditions are defined as follows:

Degree 0: C_oP_L

Degree 1: C_LP_L or C_oP_H

Degree 2: C_LP_H or C_HP_L or C_HP_H

NOTE 4 Degree 0 correspond to normal service condition as described in 2.1.1 of IEC 62271-1.

4 Classification of enclosed switchgear and controlgear

Three design classes 0, 1 and 2 are defined. They essentially correspond to the three degrees of severity of service conditions according to Clause 3.

5 Classification procedure

For the normal service conditions specified in IEC 62271-200 and IEC 62271-201, no additional test is required. Standardized switchgear and controlgear complying with these publications is considered as belonging to Design Class 0.

Satisfactory performance under severe service conditions of equipment complying with Design Class 1 or 2 is verified by testing the equipment.

Enclosed switchgear and controlgear is considered to belong to Design Class 1 if it is subjected to the level 1 ageing test according to 8.1 and satisfies the evaluation criteria of the diagnostic procedure described in Clause 9.

Enclosed switchgear and controlgear is considered to belong to Design Class 2 if it is submitted to the level 2 ageing test according to 8.2 and satisfies the evaluation criteria of the diagnostic procedure described in Clause 9.

The level 1 and level 2 ageing tests require the repeated application of identical climatic cycles followed by the diagnostic procedures specified in Clause 9. The level 2 ageing test is identical to the level 1 ageing test except that for level 2 a greater number of climatic cycles is to be applied.

This classification procedure is illustrated in the flow chart, Figure 1.

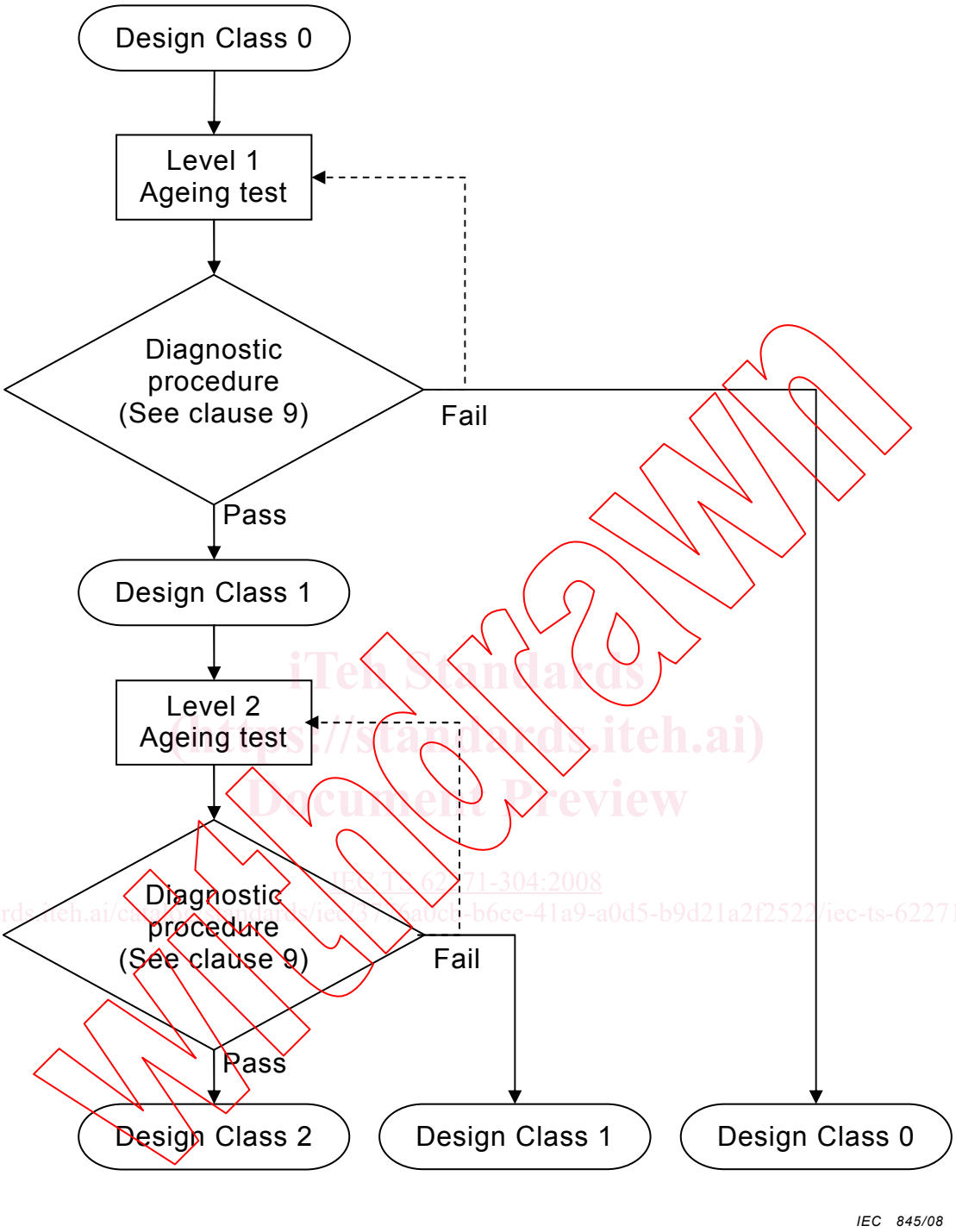

Figure 1 – Flow chart for classification procedure

6 Test facilities and associated requirements

6.1 Climatic test room

A climatic test room is required which shall be of sufficient size to accommodate the equipment to be tested. The equipment shall be installed in the climatic test room at a height of not less than 0,5 m from the ground in a manner to permit the circulation of the ambient air. The distance between walls and ceiling of the test room and walls and the top of the enclosure of the equipment shall be more than 1,0 m. Precautions shall be taken to insure that no condensed water from the walls and ceiling of the test chamber can fall on the equipment.

Figure B.1 is an explanatory figure for the test room.

6.2 Control requirements

The temperature needs to be controlled within limits of less than ±3 K. During the tests, it shall be varied cyclically between 30 °C to 50 °C. The temperature gradient shall be at least 0,5 K/min. The distribution of temperature in the whole volume of the chamber should be within the same tolerances.

The humidity also needs to be controlled within close limits over a range from below 80 % to over 95 % of relative humidity.

6.3 Energizing facilities

A three-phase high-voltage source shall be provided so that the equipment to be tested can be energised during the test. The source used for this purpose shall be able to maintain the rated voltage with a tolerance of 0 to –5 % during the climatic cycles. The voltage shall be recorded continuously during the whole duration of the tests for the purpose of checking possible disruptive discharges.

A source is required for applying diagnostic test voltages up to at least the dry power-frequency withstand voltage of the equipment to be tested. This source shall have a protective device operating in less than 0,1 s in the event of a disruptive discharge.

The sources shall comply with IEC 60060-1.

7 Selection and arrangement of the equipment for test

7.1 Selection of the equipment

Ageing test is to be made on a functional unit completely assembled and fitted with all its components as for service, measuring transformers included. The functional unit and its components shall be new and clean.

7.2 Arrangement of the equipment

The equipment to be tested shall be installed in the climatic test room, as given in 6.1, in its normal service position. The test arrangement of the functional unit shall not be more favourable than the normal service arrangement, especially in respect of the external connections.