



**Environmental Engineering (EE);
Environmental conditions and environmental tests for
telecommunications equipment;
Part 2: Specification of environmental tests;
Sub-part 0: Introduction**

ReferenceREN/EE-017010

Keywordsenvironment, testing

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
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Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Environmental Engineering (EE), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

The present document is part 2, sub-part 0 of a multi-part deliverable covering environmental conditions and environmental tests for telecommunications equipment, as identified below:

Part 1: "Classification of environmental conditions";

Part 2: "Specification of environmental tests";

Sub-part 0: "Introduction";

Sub-part 1: "Storage";

Sub-part 2: "Transportation";

Sub-part 3: "Stationary use at weatherprotected locations";

Sub-part 4: "Stationary use at non-weatherprotected locations";

Sub-part 5: "Ground vehicle installations";

Sub-part 6: "Ship environments";

Sub-part 7: "Portable and non-stationary use";

Sub-part 8: "Stationary use at underground locations".

Part 1 specifies different standardized environmental classes covering climatic, biological, chemically and mechanically active substances, and mechanical conditions during storage, transportation and in use.

Part 2 specifies the test severities, test methods and performance criteria for the different environmental classes.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document specifies the test severities and methods for verification of the required resistibility for equipment which is to be stored, transported and used in the environments which characteristics are defined in ETSI EN 300 019-1 [2].

The purpose of the present document is to provide a general overview of ETSI EN 300 019-2 [3].

ETSI TR 100 035 [i.1] should be used in conjunction with ETSI EN 300 019 multi-parts deliverable. It gives an introduction to the main concepts of environmental engineering, the purpose and use of environmental classes and the corresponding test philosophy.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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- [1] ETSI EN 300 019-1-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-0: Classification of environmental conditions; Introduction".
- [2] ETSI EN 300 019-1 (all sub-parts): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1: Classification of environmental conditions".
- [3] ETSI EN 300 019-2 (all sub-parts): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2: Specification of environmental tests".
- [4] Void.
- [5] IEC 60068-2 series: "Environmental testing".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TR 100 035: "Environmental Engineering (EE); Environmental engineering; Guidance and terminology".
- [i.2] IEC 60721-2-4: "Classification of environmental conditions - Part 2-4: Environmental conditions appearing in nature - Solar radiation and temperature".

- [i.3] IEC 60068-2-5: "Environmental testing - Part 2-5: Tests - Test S: Simulated solar radiation at ground level and guidance for solar radiation testing and weathering".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 300 019-1-0 [1] and the following apply:

performance criterion: description of behaviour on an equipment to determine the effects of the applied tests on the equipment itself

tst: series of stresses applied to an equipment, in accordance to specified methods, to verify the compliance to certain performance criteria

3.2 Symbols

Void.

3.3 Abbreviations

Void.

4 General

The purpose of environmental testing is to verify that an equipment, under defined environmental conditions, can survive without irreversible failures and perform according to the defined performance criteria.

The tests defined in ETSI EN 300 019-2 [3] are not reliability tests or lifetime tests.

The severities of testing defined in sub-parts 1 to 8 of ETSI EN 300 019-2 [3] are closely correlated with the characteristic severities of the environmental classes specified in sub-parts 1 to 8 of ETSI EN 300 019-1 [2]. Furthermore, the definition of test severity has been made taking into account failure consequences, performance requirements and the test severities in IEC 60068-2 [5] test methods. In sub-parts 1 to 8 of ETSI EN 300 019-2 [3], the performance criteria are defined for each type of test and the tested equipment shall comply to these criteria.

Sub-parts 1 to 8 of ETSI EN 300 019-2 [3] define the test severities and test methods to verify the compliance of an equipment to a specific environmental class. In many cases these test conditions are different from those severities shown in sub-parts 1 to 8 of ETSI EN 300 019-1 [2] and for some environmental parameters no testing are recommended based on the justification provided in the sub-parts 1 to 8 of ETSI EN 300 019-2 [3]. Where test conditions are different from the environmental class severity, this is done in order to:

- produce the effect of the environment rather than attempt to reproduce the actual physical environmental conditions; and/or
- enable standard testing to IEC 60068-2 [5]; and/or
- recognize that the given characteristic severity relates to a condition with a very low probability of occurrence.

Where no test is specified:

- other specified tests are considered to be more severe and cover that parameter; and/or
- the environmental condition is not negatively impacting the functionality and/or the structure of an equipment and consequently does not require testing. However certain product specifications may require additional testing; and/or
- the environmental condition is a valid one, but no standard test method exists; and/or

- the environmental condition is considered when choosing components and materials.

The mechanical test severities given may deviate from the characteristic severities and may even be split into several alternative tests, taking into consideration equipment mass. This does not invalidate the verification because:

- depending on the equipment category, size, installation method and location inside the premises, the probable stresses are different within the class;
- usually only one combination of several existing complex mechanical stresses are given as a characteristic. Therefore, tests with different severities and methods can serve as verification and reveal the same failure mechanisms.

In meeting the test requirements defined sub-parts 1 to 8 of ETSI EN 300 019-2 [3], the equipment shall be deemed to comply with the requirements of environmental classes defined in sub-parts 1 to 8 of ETSI EN 300 019-1 [2].

It is emphasized that performance criteria which apply to a specific equipment shall be included in the relevant product specification. In particular, if relevant, the distinction between normal and reduced performance and between intermittent function and cessation of function should be precisely defined.

The environmental classifications given in sub-parts 1 to 8 of ETSI EN 300 019-1 [2] and the test severities given in sub-parts 1 to 8 of ETSI EN 300 019-2 [3] do not cover any microenvironment caused by installing one equipment inside another, e.g. several sub-racks installed inside one miscellaneous rack. In such cases the applicable conditions shall be agreed between vendor and buyer.

In some cases, test severities have been chosen deviating from the IEC preferred values, e.g. in order to stay within the prescribed limits of a climatogram.

5 Users guide

5.1 Test specifications and the states of test item

5.1.0 General

The relevant environmental test programme shall specify whether the test item is powered-up and whether it is in-use during each phase of the tests.

Two states of test item are usually required. These are the equipment "not in-use" and "in-use" states where:

- "not in-use" is normally the condition applicable to storage and transportation (for which the test programme shall specify if the equipment is to be in its packaging or not);
- "in-use" is normally the condition of the equipment in its working environment (for which the test programme shall specify the equipment's performance criteria, heat dissipation, failure consequences, etc.).

5.1.1 In-use tests

The required performance before, during and after the test are defined in sub-parts 1 to 8 of ETSI EN 300 019-2 [3] and shall be specified in the product specification. Input and load conditions of the equipment shall be chosen to obtain full utilization of the equipment under test. The dissipation shall be maximized by selection of supply power and load conditions, except for the steady-state-low-temperature test, where it shall be minimized.

The tests shall be conducted in accordance with IEC 60068-2 series [5], unless otherwise stated in sub-parts 1 to 8 of ETSI EN 300 019-2 [3]. However, in all "in-use" tests, the performance criteria are those that the equipment under test shall remain in its operational state.

5.1.2 Not in-use tests

The test specifications corresponding to storage and transportation may call for the same or different test severities. The relevant environmental test programme shall describe the final compilation, where states of test item, performance requirements and failure consequences have been taken into account.

5.2 Selection of tests and test severities

In sub-parts 1 to 8 of ETSI EN 300 019-1 [2], alternative characteristic severities for certain environmental parameters may be chosen as special requirements in the environmental class. These special requirements shall be described in the relevant product specification and noted also in the test specification.

Some special test requirements may also exist. Usually they are based on the simultaneous combined effect of parameters causing similar stresses to the equipment.

Information about the combined effect of air temperature and solar radiation and the cooling effect of heat radiation are given in IEC 60721-2-4 [i.2]. The effect of surface colour and roughness on reflection of light and emission of heat are given in IEC 60068-2-5 [i.3].

For each environmental parameter all test severities in the chosen classes for storage, transportation and in-use should be considered and the relevant severity or severities should be chosen for the test programme. Non-relevant tests should be deleted from the test programme. For instance, experience from earlier tests may justify deletion of some tests.

6 Topics on making a test programme

6.0 General

The various aspects to be considered when formulating a test programme are discussed in ETSI TR 100 035 [i.1], clause 6.4.3:

- the programme is a result of co-operation between environmental experts, test engineers and equipment development engineers;
- an efficient way to perform the complete test programme requires engineering experience (knowledge about materials, components, construction and design), common sense and realistic judgements;
- considerations on testing costs, technology of equipment and life cycle costs shall be included;
- failure consequences other than moderate and/or degraded performance requirements can be taken into account by choosing, for example, a larger test sample or by modification of test severities. For further information see ETSI TR 100 035 [i.1].

Clauses 6.1 to 6.3 describe the most important items.

6.1 Environmental resistibility requirements

The environmental class defines the overall requirements.

The resistibility requirement for a given class is valid whether or not a test is included in the test specification programme.

The test specifications give the test severities for the verification of the resistibility.

The equipment under test shall be identical to that placed on the market.

For storage and transportation tests, if the equipment is normally packaged then it shall be tested in its packaging. For "in-use" tests, if the equipment is specially mounted (e.g. in a protective enclosure or with shock absorbing buffers), then it shall be tested as such.

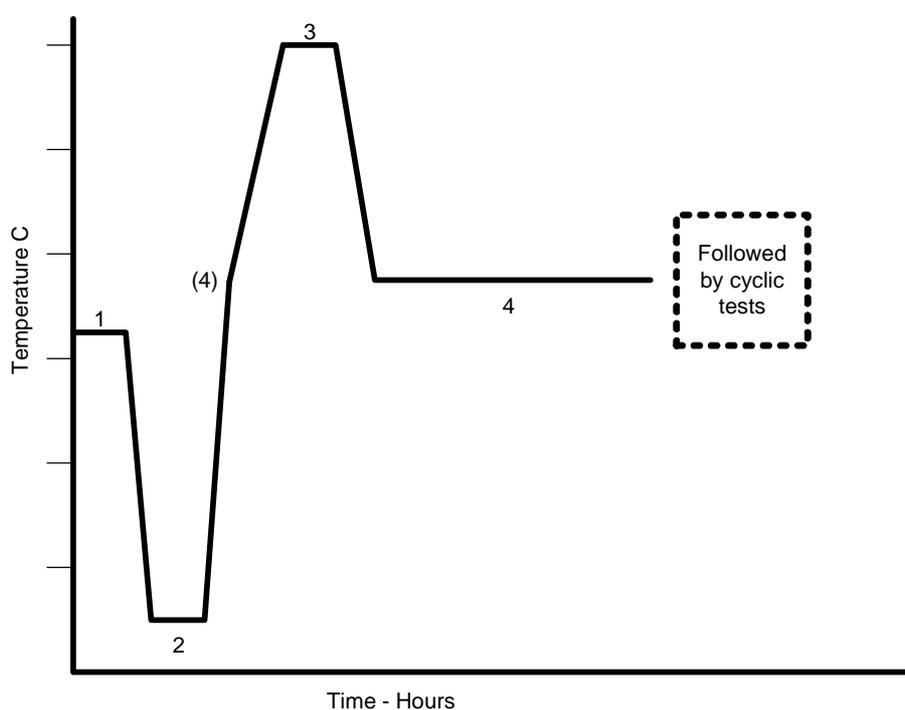
6.2 Test programme

For certain reasons (e.g. economic) the test programme can have several tests in sequence on one single equipment. Because of the impact of one test on another the test programme should avoid over-stress, since each test is defined as a stand-alone test.

A test sequence is strongly advised to provide a satisfactory reproducibility of a test program. The test sequence can be set up by taking into account the test severity and duration of the relevant class. Particularly the rate of change ($0,5\text{ }^{\circ}\text{C}$ or $1\text{ }^{\circ}\text{C}/\text{min}$) should not be exceeded during the whole sequence.

Only results from identical test sequences are comparable.

The preferred climatic test sequence is to start with a thermal stabilized system at room temperature and test first the cold test then the dry heat test, followed by the damp heat steady state test.



- 1) Stabilization and measurements at room temperature
- 2) Cold test
- 3) Dry heat test
- 4) Damp heat steady state test

NOTE 1: If conditions allow 4 can be carried out at (4) before 3. However, results of the two sequence tests are not comparable.

NOTE 2: The sequence in the figure is schematic only. The test severity, rate of change of temperature, stabilization, test duration and measuring points for each test are defined in ETSI EN 300 019-1 [2] and IEC 60068-2 [5].

Figure 1: Preferred Climatic Test Sequence

If a failure occurs during the test cycle then only the test condition where the failure occurred should be repeated with a repaired test object. The complete test duration of that condition shall be repeated.

The cyclic temperature and cyclic humidity (condensation) tests should be treated as individual cycles and could be tested after the test sequence. If specified, the cold start test should be performed separately.

6.3 Verification

The tests cover conditions during "not in-use" (transportation, and storage) and "in-use".

The "not in-use" tests with the same test procedure for storage and transportation shall be considered together and the most severe test should be selected for the test programme.

For equipment whose performance may be reduced at a characteristic severity, a statement shall be made in the test programme which details the acceptable degradation. The functional requirements may be separated into primary and secondary functions and those deemed to be essential shall be clearly identified.

In order to reduce the testing time, the number of functions to be checked shall be reduced to a minimum ensuring a high degree of confidence in the equipment's overall functionality.

The test programme shall detail which functions are to be checked before, during and after conditioning.

In-use tests require checking the item under test during conditioning.

Actions to be taken in case of failure should be decided before testing.

Failure criteria should be explicit.

Annex A (informative): Change History

Date	Version	Information about changes
05-2021	2.2.1	General revision

History

Document history		
Edition 1	May 1994	Publication as ETSI ETS 300 019-2-0
V2.1.2	September 2003	Publication
V2.1.6	October 2021	EN Approval Procedure AP 20220123: 2021-10-25 to 2022-01-24