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Environmental Engineering (EE);
Environmental conditions and environmental tests for telecommunications equipment;
Part 2-4: Specification of environmental tests;
Stationary use at non-weatherprotected locations

Reference

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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 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

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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 4 of a multi-part deliverable. Full details of the entire series can be found in part 2, sub-part 0 [i.1].

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
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1 Scope

The present document specifies test methods and severities for verification of the required resistibility of equipment according to the relevant environmental class.

The tests defined in the present document apply to stationary use of equipment at non-weatherprotected locations covering the environmental conditions stated in ETSI EN 300 019-1-4 [1].

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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The following referenced documents are necessary for the application of the present document.

[1] ETSI EN 300 019-1-4 (04-2014): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weatherprotected locations".

[2] IEC 60068-2-1 (03-2007): "Environmental testing - Part 2-1: Tests - Test A: Cold".

[3] Void.

[4] Void.

[5] ATIS T1.0600329 (2014): "Network Equipment - Earthquake Resistance".

[6] Void.

[7] IEC 60068-2-2 (07-2007): "Environmental testing - Part 2-2: Tests - Test B: Dry heat".

[8] IEC 60068-2-14 (01-2009): "Environmental testing - Part 2-14: Tests - Test N: Change of temperature".

[9] IEC 60068-2-30 (08-2005): "Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)".

[10] IEC 60068-2-64 (04-2008): "Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance".

[11] IEC 60068-2-27 (02-2008): "Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock".

[12] IEC 60068-2-6 (12-2007): "Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)".

[13] IEC 60068-2-57 (04-2013): "Environmental testing - Part 2-57: Tests - Test Ff: Vibration - Time-history and sine-beat method".

[14] Void.

[15] IEC 60068-2-18 (03-2017): "Environmental testing - Part 2-18: Tests - Test R and guidance: Water".

[16] IEC 60068-2-78 (10-2012): "Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state".

[17] IEC 60068-2-11 (01-1981): "Basic environmental testing procedures - Part 2-11: Tests - Test Ka: Salt mist".

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 EN 300 019-2-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-0: Specification of environmental tests; Introduction".

[i.2] IEC 60068-2-68 (8-1994): "Environmental testing - Part 2: Tests - Test L: Dust and sand".

[i.3] IEC 60068-2 (all parts): "Environmental testing - Part 2: Tests".

[i.4] 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".

3 Definitions

For the purposes of the present document, the terms and definitions given in ETSI EN 300 019-1-0 [i.4] apply.

4 Environmental test specifications

4.0 General

The equipment shall be tested in its operational state throughout the test conditions described in the present document. The detailed descriptions of the environmental conditions are given in clauses 4 and 5 of ETSI EN 300 019-1-4 [1].

ETSI EN 300 019-2-0 [i.1] forms a general overview of part 2 of this multi-part deliverable.

4.1 Equipment setup and configuration

The equipment shall be tested in its operational state throughout the test conditions described in the present document unless otherwise stated. Input and load conditions of the equipment shall be chosen to obtain full utilization of the equipment under test. The heat dissipation shall be maximized, except for the steady state, low temperature test, where it shall be minimized.

4.2 Performance criteria

The following performance criteria shall apply in the tests defined by the present document.

Performance criterion A:

The equipment shall function according to the manufacturer specifications before, during and after the tests. No degradation of performance or loss of function is allowed below the performance level specified by the manufacturer when the apparatus is used as intended. If the minimum performance level is not specified by the manufacturer, then this may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B:

The equipment shall function according to the manufacturer specifications before and after the tests. During the test it is not required to monitor the equipment functionality. No degradation of performance or loss of function is allowed below the performance level specified by the manufacturer when the apparatus is used as intended. If the minimum performance level is not specified by the manufacturer, then this may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C:

The equipment shall function according to the manufacturer specifications before and after the tests. No degradation of performance or loss of function is allowed below the performance level specified by the manufacturer when the apparatus is used as intended. If the minimum performance level is not specified by the manufacturer, then this may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
During the application of the test, temporary loss of function is allowed but after the test the equipment shall restore to the normal functionality without replacement of components, manual rebooting or human intervention.
The equipment shall sustain the test without permanent structural or mechanical damage.

Performance criterion D:

This performance criterion applies to the enclosure of the equipment. No corrosion traces (e.g. rust) or deterioration of the enclosure shall occur at the end of the test.

4.3 Specification T 4.1: non-weatherprotected locations, climatic tests

The specification in table 1 shall apply to non-weatherprotected locations described in ETSI EN 300 019-1-4 [1].

Table 1: Test specification T 4.1: Stationary use at non-weatherprotected locations - climatic tests

Environmental parameter			Environmental Class 4.1	Environmental test specification T 4.1: Stationary use, Non-weatherprotected locations					
Type	**Parameter**	**Detail parameter**	**Characteristic severity**	**Test severity**	**Duration**	**Reference**	**Method**	**Performance criterion**	**Notes**
Air temperature	Low	(°C)	-33	-33 or -45	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1
	High	(°C)	+40	+40 or +55	16 h	IEC 60068-2-2 [7]	Bb/Bd/Be: Dry heat	A	2
	Change	(°C) (°C/min)	 0,5	-10 to +40 0,5	2 cycles t_1 = 3 h	IEC 60068-2-14 [8]	Nb: Change of temperature	A	3
Humidity	Relative	Low (%)	15	None					8
		High (%) (°C)	100	93 +30	10 d	IEC 60068-2-78 [16]	Cab: Damp heat steady state	A	4
		Condensation (%) (°C)	Yes	 90 to 100 +30	2 cycles	IEC 60068-2-30 [9]	Db: Damp heat, cyclic Variant 1	A	5
	Absolute	Low (g/m^3)	0,26	None					
		High (g/m^3)	25	None					6
Air	Pressure	Low (kPa)	70	None					7
		High (kPa)	106	None					7
	Speed	(m/s)	50	None					8
Water	Rain	Intensity	6 mm/min	0,01 m^3/min 90 kPa	3 min/m^2 or 15 min	IEC 60068-2-18 [15]	Rb: Impacting water, method 1.2 "spray nozzle"	B	9
		Low temperature (°C)	+5	None					
	Other sources		Splashing water	None					10
	Icing & frosting		Yes	None					8
Radiation	Solar	(W/m^2)	1 120	None					11
	Heat	(W/m^2)	Negligible	None					
Chemically active substances	Sulphur	SO_2 (mg/m^3)	0,3 to 1,0	None					12
		H_2S (mg/m^3)	0,1 to 0,5	None					12
	Chlorine	Salt mist	Sea and road salt	35 °C, 5 % NaCl solution	10 d	IEC 60068-2-11 [17]	Ka: Salt mist	D	12
		Cl (mg/m^3)	0,1 to 0,3	None					12
		HCl (mg/m^3)	0,1 to 0,5	None					12

Environmental parameter			Environmental Class 4.1	Environmental test specification T 4.1: Stationary use, Non-weatherprotected locations					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criterion	Notes
	Nitrogen	NO_x (mg/m^3)	0,5 to 1,0	None					12
		NH_3 (mg/m^3)	1,0 to 3,0	None					12
	Hydrogen fluoride HF	(mg/m^3)	0,01 to 0,03	None					12
	Ozone O_3	(mg/m^3)	0,05 to 0,1	None					12
Mechanically active substances	Dust	Sedimentation (mg/(m^{2}h))	20	None					13
		Suspension (mg/m^3)	5	None					13
	Sand	(mg/m^3)	300	None					13
Flora and fauna	Micro organisms		Mould, fungus, etc.	None					14
	Rodents, insects		Rodents, etc.	None					14

NOTE 1: (Air temperature, low). Two test temperatures are given, the lower test temperature shall apply if the equipment is protected against solar irradiation. The higher test temperature includes heat irradiation emitted from the equipment. The temperature cold start up test shall be performed according to the characteristic severity temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the cold start up test shall commence once low temperature stability is achieved.

NOTE 2: (Air temperature, high). Two test temperatures are given, the lower test temperature shall apply if the equipment is protected against solar radiation or the equipment is ventilated (natural or forced). The higher test temperature includes the heating effects of solar radiation. The temperature start up test shall be performed according to the characteristic severity temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the high temperature start up test shall commence once high temperature stability is achieved.

NOTE 3: (Air temperature, change). This test is intended for specimen with large thermal time constant. For equipment where the rapid change of temperature of the surface has a significant effect on internal components, the values of the change of temperature up to 5 °C/min can be applied.

NOTE 4: (Humidity, relative high). IEC 60068-2-78 [16] Test Cab shall be used with test severities not higher than climatogram limits for this class.

NOTE 5: (Condensation). IEC 60068-2-30 [9] Test Db shall be used with test severities not higher than climatogram limits for this class.

NOTE 6: (Humidity, absolute, high). This effect is considered to be partly included in the damp heat test IEC 60068-2-78 [16] Test Cab.

NOTE 7: (Air pressure, low and high). No test is required for normal applications, because the effect of air pressure is evaluated at the component level.

NOTE 8: There is no IEC 60068-2 [i.3] series test for this parameter.

NOTE 9: (Water, rain). IEC 60068-2-18 [15] Test Rb method 1.2 "Spay nozzle" has been chosen even if it does not imitate normal rain. It is a simple hand held shower test, easy to perform and can demonstrate that the specimen design is adequately toleranced to survive this condition. The cooling effect of the low temperature of the rain is included in IEC 60068-2-14 [8] Test Nb. Two durations are given, whichever is the greatest should be chosen.

NOTE 10: (Water, other sources). No test is required because the effect is already included in IEC 60068-2-18 [15] Test Rb.

NOTE 11: (Radiation). The heating effect of solar radiation is included in the higher test temperature in IEC 60068-2-2 [7] Test Bb as described in note 2. Photochemical tests can be performed separately for component and materials.

NOTE 12: (Chemically active substances). Characteristic severities are mean/maximum values. The characteristic severities should be considered when designing the equipment and when choosing components and materials. No test is required in the present document, except for the mechanical enclosures, where the salt mist test is required to be performed. The execution of this test can be performed on the entire enclosure or subparts of the enclosure if the results are not affected.

NOTE 13: (Mechanically active substances). The characteristic severities are much lower than the lowest test severity in IEC 60068-2-68 [i.2] Test L and therefore no test is required. This condition should be considered when designing the equipment and choosing components and materials.

NOTE 14: (Flora and fauna). The characteristic severities should be considered when choosing components and materials.

4.4 Specification T 4.1E: non-weatherprotected locations - extended, climatic tests

The specification in table 2 shall apply to non-weatherprotected locations - extended as described in ETSI EN 300 019-1-4 [1].

Table 2: Test specification T 4.1E: Stationary use at non-weatherprotected locations, extended - climatic tests

Environmental parameter			Environmental Class 4.1E	Environmental test specification T 4.1E: Stationary use Non-weatherprotected locations - extended					
Type	**Parameter**	**Detail parameter**	**Characteristic severity**	**Test severity**	**Duration**	**Reference**	**Method**	**Performance criterion**	**Notes**
Air temperature	Low	(°C)	-45	-45 or -55	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1
	High	(°C)	+45	+45 or +60	16 h	IEC 60068-2-2 [7]	Bb/Bd/Be: Dry heat	A	2
	Change	(°C) (°C/min)	 0,5	-10 to +45 0,5	2 cycles t1 = 3 h	IEC 60068-2-14 [8]	Nb: Change of temperature	A	3
Humidity	Relative	Low (%)	8	None					8
		High (%) (°C)	100	93 +30	10 d	IEC 60068-2-78 [16]	Cab: Damp heat steady state	A	4
		Condensation (%) (°C)	Yes	 90 to 100 +30	2 cycles	IEC 60068-2-30 [9]	Db: Damp heat cyclic Variant 1	A	5
	Absolute	Low (g/m^3)	0,03	None					6
		High (g/m^3)	30	None					
Air	Pressure	Low (kPa)	70	None					7
		High (kPa)	106	None					7
	Speed	(m/s)	50	None					8
Water	Rain	Intensity	15 mm/min	0,01 m^3/min 90 kPa	6 min/m^2 or 30 min	IEC 60068-2-18 [15]	Rb: Impacting water, method 1.2 "spray nozzle"	B	9
		Low temperature (°C)	+5	None					
	Other sources		Splashing water	None					10
	Icing & frosting		Yes	None					8
Radiation	Solar	(W/m^2)	1 120	None					11
	Heat	(W/m^2)	Negligible	None					
Chemically active substances	Sulphur	SO_2 (mg/m^3)	0,3 to 1,0	None					12
		H_2S (mg/m^3)	0,1 to 0,5	None					12
	Chlorine	Salt mist	Sea and road salt	35 °C, 5 % NaCl solution	10 d	IEC 60068-2-11 [17]	Ka: Salt mist	D	12
		Cl (mg/m^3)	0,1 to 0,3	None					12
		HCl (mg/m^3)	0,1 to 0,5	None					12
	Nitrogen	NO_x (mg/m^3)	0,5 to 1,0	None					12
		NH_3 (mg/m^3)	1,0 to 3,0	None					12