



**Environmental Engineering (EE);
Environmental conditions and environmental tests
for telecommunications equipment;
Part 2-3: Specification of environmental tests;
Stationary use at weatherprotected locations**

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Environmental Engineering (EE).

The present document is part 2, sub-part 3 of a multi-part deliverable. Full details of the entire series can be found in part 2, sub-part 0 [i.2].

National transposition dates

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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).

"must" and **"must not"** are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

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

The tests in the present document apply to stationary use of equipment at weatherprotected locations covering the environmental conditions stated in ETSI EN 300 019-1-3 [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.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference/>.

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

- [1] ETSI EN 300 019-1-3: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weatherprotected locations".
- [2] IEC 60068-2-1:2007: "Environmental testing - Part 2-1: Tests - Test A: Cold".
- [3] Void.
- [4] IEC 60721-3-3:2019: "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 3: Stationary use at weatherprotected locations".
- [5] Void.
- [6] IEC 60068-2-2:2007: "Environmental testing - Part 2-2: Tests - Test B: Dry heat".
- [7] IEC 60068-2-14:2009: "Environmental testing - Part 2-14: Tests - Test N: Change of temperature".
- [8] IEC 60068-2-78:2012: "Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state".
- [9] IEC 60068-2-30:2005: "Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)".
- [10] IEC 60068-2-64:2008+AMD1:2019: "Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance".
- [11] IEC 60068-2-27:2008: "Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock".
- [12] IEC 60068-2-6:2007: "Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)".
- [13] IEC 60068-2-57:2013: "Environmental testing - Part 2-57: Tests - Test Ff: Vibration - Time-history and sine-beat method".
- [14] IEC 60068-2-68:1994: "Environmental testing - Part 2-68: Tests - Test L: Dust and sand".

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 300 019-1-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-0: Classification of environmental conditions; Introduction".
- [i.2] 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".

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 [i.1] apply.

3.2 Symbols

Void.

3.3 Abbreviations

Void.

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 300 019-1-3 [1].

ETSI EN 300 019-2-0 [i.2] 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 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 equipment 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 equipment 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 equipment 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 equipment 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 equipment 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 equipment 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 Specifications T 3.1 and T 3.1E: Temperature-controlled locations

Specification T 3.1: Temperature-controlled locations - normal operating conditions.

The specification in table 1 and table 2 shall apply to permanently temperature-controlled enclosed locations where humidity is usually not controlled.

Table 1: Test specification T 3.1: Temperature-controlled locations - climatic tests

Environmental parameter			Environmental Class 3.1		Environmental test specification T 3.1: In-use, Temperature-controlled locations				
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Air temperature	Low	(°C)	+5	+5	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1
	High	(°C)	+40	+40 or +50	16 h	IEC 60068-2-2 [6]	Bb/Bd/Be: Dry heat	A	2
	Change	(°C) (°C/min)	0,5	+25 to+40 0,5	half cycle $t_1 = 3$ h	IEC 60068-2-14 [7]	Nb: Change of temperature	A	3
Humidity	Relative	low (%)	5	None					4
		high (%)	85	85	4 d	IEC 60068-2-78 [8]	Cab: Damp heat steady state	A	5
		condensation (°C)	no	None					
	Absolute	low (g/m ²)	1	None					4
		high (g/m ²)	25	None					7
Air	Pressure	low (kPa)	70	None					8
		high (kPa)	106	None					8
	Speed	(m/s)	5,0	None					4
Water	Rain	Intensity	no	None					
		low temperature	no	None					
	Other sources		no	None					
Radiation	Icing & frosting		no	None					
	Solar	(W/m ²)	700	None					9
Chemically active substances	Sulphur	(W/m ²)	600	None					10
		Heat							
	Sulphur	SO ₂ (mg/m ³)	0,3/1,0	None					11
		H ₂ S (mg/m ³)	0,1/0,5	None					11
	Chlorine	salt mist	sea and road salt	None					11
		Cl (mg/m ³)	0,1/0,3	None					11
		HCl (mg/m ³)	0,1/0,5	None					11
	Nitrogen	NO _x (mg/m ³)	0,5/1,0	None					11
		NH ₃ (mg/m ³)	1,0/3,0	None					11
Hydrogen fluoride HF		(mg/m ³)	0,01/0,03	None					11

Environmental parameter			Environmental Class 3.1		Environmental test specification T 3.1: In-use, Temperature-controlled locations				
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
	Ozone O ₃	(mg/m ³)	0,05/0,1	None					11
Mechanically active substances	Dust	sedimentation (mg/(m ² h))	1,5	None					12
		suspension (mg/m ³)	0,2	None					13
	Sand	(mg/m ³)	30	None					12
Flora and fauna	Micro organisms		negligible						
	Rodents, insects		negligible						
NOTE 1: (Air temperature, low). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If a cold start up test is performed, the characteristic severity should be used as a cold start up 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). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If two test temperatures are given, the lower test temperature applies if the equipment is protected against solar and heat radiation or the equipment is ventilated (natural or forced). The higher test temperature includes the heating effects of solar and/or heat radiation. If a high temperature start up test is performed, the characteristic severity should be used as a high start up 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). The change of temperature test is normally used to check design tolerance. IEC 60068-2-14 [7] Test Nb shall be used. For change of temperature of 0,5 °C/min, the cooling gradient may be reduced to 0,2 °C/min where test chamber restrictions preclude a gradient of 0,5 °C/min.									
NOTE 4: (Relative humidity, low). There is no IEC 60068-2 series test method for this parameter.									
NOTE 5: (Humidity, relative, high). IEC 60068-2-78 [8] Test Cab shall be used with test values not higher than climatogram limits for this class.									
NOTE 6: (Condensation). IEC 60068-2-30 [9] Test Db shall be used with test values not higher than climatogram limits for this class.									
NOTE 7: (Humidity, absolute, high). This effect is considered to be partly included in the damp heat test IEC 60068-2-78 [8] Test Cab.									
NOTE 8: (Air pressure, low and high). No test is recommended for normal applications, because the effect of air pressure is evaluated at the component level.									
NOTE 9: (Radiation, solar). The higher test temperature as described in note 2 includes the heating effect of solar radiation. Photochemical tests can be made separately for components and materials.									
NOTE 10: (Radiation, heat). The higher test temperature as described in note 2 includes the heating effect.									
NOTE 11: (Chemically active substances). The characteristic severities are given as mean/maximum values. These severities should be considered when designing the equipment and when choosing components and materials. No test is recommended in the present document.									
NOTE 12: (Mechanically active substances). The characteristic severities are much lower than lowest test severity in IEC 60068-2-68 [14] Test L and therefore no test is recommended. This condition should be considered when designing the equipment and when choosing components and materials.									

Environmental parameter			Environmental Class 3.1		Environmental test specification T 3.1: In-use, Temperature-controlled locations				
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
NOTE 13: (Mechanically active substances). The characteristic severities are much lower than the lowest test severity in IEC 60068-2-68 [14] Test Lb and therefore no test is required. This condition should be considered when designing the equipment and choosing components and materials. One possible test to evaluate the impact of corrosion due to dust can be found in Annex A.									

Table 2: Test specification T 3.1: Temperature-controlled locations - mechanical tests

Environmental parameter			Environmental Class 3.1		Environmental test specification T 3.1: In-use, Temperature-controlled locations				
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Vibration	Sinusoidal	displacement (mm) acceleration (m/s ²) frequency range (Hz) axes of vibration	0,3 1,0 2-9 9-200	none					1
Shocks	Shocks	shock spectrum duration (ms) acceleration (m/s ²) number of shocks direction of shocks	Type L 22 40	half sine 11 30 6	3 in each direction	IEC 60068-2-27 [11]	Ea: Shock	A	2
NOTE 1: (Vibration, sinusoidal). No test is recommended as the characteristic severities represent insignificant levels of vibration. The severities are given as peak values.									
NOTE 2: (Shocks). The values for test severity are not specified in IEC 60068-2 series. The severities are given as peak values. The energy content and the SRS of the shock given as test severity have been considered more appropriate than that given by the characteristic severity. Equipment under test shall be mounted in the "in use" position. The equipment function shall be monitored throughout the test.									

Specification T 3.1E: Temperature-controlled locations - exceptional operating conditions.

The specification in table 3 shall apply to permanently temperature-controlled locations where humidity is usually not controlled. The reference class is the same as for T 3.1, but with extended temperature and humidity ranges.

Table 3: Test specification T 3.1E: Temperature-controlled locations, exceptional operating conditions - climatic tests

Environmental parameter			Environmental Condition 3.1E	Environmental test specification T 3.1E: In-use, Temperature-controlled locations - Exceptional					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Air temperature	Low	(°C)	-5	-5	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1
	High	(°C)	+45	+45 or +55	16 h	IEC 60068-2-2 [6]	Bb/Bd/Be: Dry heat	A	2
	Change	(°C) (°C/min)	0,5	+25 to+45 0,5	half cycle t ₁ = 3 h	IEC 60068-2-14 [7]	Nb: Change of temperature	A	3
Humidity	Relative	low (%)	5	none					4
		high (%)	90	93	4 d	IEC 60068-2-78 [8]	Cab: Damp heat steady state	A	5
		condensation	no						
	Absolute	low (g/m ³)	1	none					4
		high (g/m ³)	25						6
Radiation	Solar	(W/m ²)	700						7
	Heat	(W/m ²)	600						8

NOTE 1: (Air temperature, low).

The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If a cold start up test is performed, the characteristic severity should be used as a cold start up 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).

The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If two test temperatures are given, the lower test temperature applies if the equipment is protected against solar and heat radiation or the equipment is ventilated (natural or forced). The higher test temperature includes the heating effects of solar and/or heat radiation. If a high temperature start up test is performed, the characteristic severity should be used as a high start up 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).

The change of temperature test is normally used to check design tolerance. IEC 60068-2-14 [7] Test Nb shall be used. For change of temperature of 0,5 °C/min, the cooling gradient may be reduced to 0,2 °C/min where test chamber restrictions preclude a gradient of 0,5 °C/min.

NOTE 4: (Relative humidity, low).

There is no IEC 60068-2 series test method for this parameter.

NOTE 5: (Humidity, relative, high).

IEC 60068-2-78 [8] Test Cab shall be used with test values 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 [8] Test Cab.

NOTE 7: (Radiation, solar).

The higher test temperature as described in note 2 includes the heating effect of solar radiation. Photochemical tests can be made separately for components and materials.

NOTE 8: (Radiation, heat).

The higher test temperature as described in note 2 includes the heating effect.