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**Environmental Engineering (EE);
Environmental conditions and environmental tests
for telecommunications equipment;
Part 2-1: Specification of environmental tests;
Storage**

Reference

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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 1 of a multi-part deliverable covering the 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 and biological conditions, chemically and mechanically active substances and mechanical conditions during storage, transportation and in use.

Part 2 specifies the recommended test severities and test methods for the different environmental classes.

National transposition dates	
Date of adoption of this EN:	27 November 2017
Date of latest announcement of this EN (doa):	28 February 2018
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2018
Date of withdrawal of any conflicting National Standard (dow):	31 August 2018

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 verification of the required resistibility of equipment according to the relevant environmental class.

The tests defined in the present document apply to storage of equipment covering the environmental conditions stated in ETSI EN 300 019-1-1 [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/>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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

- [1] ETSI EN 300 019-1-1 (2014): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-1: Classification of environmental conditions; Storage".
- [2] Void.
- [3] Void.
- [4] IEC 60068-2-1:2007: "Environmental testing - Part 2-1: Tests - Test A: Cold".
- [5] IEC 60068-2-2:2007: "Environmental testing - Part 2-2: Tests - Test B: Dry heat".
- [6] IEC 60068-2-6:2007: "Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)".
- [7] IEC 60068-2-14:2009: "Environmental testing - Part 2-14: Tests - Test N: Change of temperature".
- [8] IEC 60068-2-18:2017: "Environmental testing - Part 2-18: Tests - Test R and guidance: Water".
- [9] IEC 60068-2-27:2008: "Environmental testing. Part 2-27: Tests - Test Ea and guidance: Shock".
- [10] IEC 60068-2-30:2005: "Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 + 12 hour cycle)".
- [11] IEC 60068-2-78:2012: "Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state".
- [12] IEC 60068-2-64:2008: "Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance".

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.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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 (2003): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-0: Specification of environmental tests; Introduction".
- [i.2] IEC 60068-2-68:1994: "Environmental testing - Part 2-68: Tests - Test L: Dust and sand".
- [i.3] 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.3] apply.

4 Environmental test specifications

4.0 General

The equipment shall be tested in the state in which it is normally stored where this is possible. For example, if the detailed descriptions of the environmental conditions are given in clauses 4 and 5 of ETSI EN 300 019-1-1 [1].

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

If the equipment is normally stored in a packed state then it shall be tested in its packaging.

4.1 Equipment setup and configuration

The equipment shall be tested in the state in which it is normally stored where this is possible. For example, if the equipment is stored in a packed state, then it shall be tested in its packaging. If the equipment can be stored both with and without its packaging it is necessary to perform tests for both configurations. For some tests and equipment, the test may be more severe for the packaged rather than the unpacked equipment. For example, for an equipment in a sealed package, the change of temperature test may produce condensation.

4.2 Performance criteria

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

Performance criterion A:

The equipment, or piece of equipment, shall be verified before and after the tests. The equipment shall function according to the manufacturer specifications before and after the test. No electrical or mechanical damages shall be allowed due to the application of the tests.

4.3 Specification T 1.1: Weatherprotected, partly temperature-controlled storage locations

The specifications in tables 1 and 2 shall apply to weatherprotected or partially weather-controlled storage locations having partially temperature or humidity control described in ETSI EN 300 019-1-1 [1].

Table 1: Test specification T 1.1: Weatherprotected, partly temperature-controlled storage locations - climatic tests

Environmental parameter			Environmental Class 1.1	Environmental test specification T1.1: Weatherprotected, partly temperature-controlled storage locations					
Type	Parameter	Detail parameter	Characteristic Severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
	low	(°C)	-5	-5	72 h	IEC 60068-2-1 [4]	Ab: Cold	A	
Air temperature	high	(°C)	+45	+45 or +55	72 h	IEC 60068-2-2 [5]	Bb: Dry heat	A	1
	change	(°C/min)	0,5	None					2
		low (%)	5	None					7
	relative	high (%)	95	93	96 h	IEC 60068-2-78 [11]	Cab: Damp heat steady state	A	3
		(°C)		+30					
Humidity		condensation	Yes	None					4
	absolute	low (g/m ³)	1	None					7
		high (g/m ³)	29						5
	pressure	low (kPa)	70	None					6
Air		high (kPa)	106	None					6
	speed	(m/s)	1	None					7
	rain	intensity	no						
Water		low temperature	no						
	other sources		no						
	icing & frosting		yes	None					7
Radiation	solar	(W/m ²)	700	None					8
	heat	(W/m ²)	600	None					8

Environmental parameter			Environmental Class 1.1	Environmental test specification T1.1: Weatherprotected, partly temperature-controlled storage locations					
Type	Parameter	Detail parameter	Characteristic Severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
	sulphur	SO ₂ (mg/m ³)	0,3/1,0	None					9
		H ₂ S (mg/m ³)	0,1/0,5	None					9
		Salts	sea and road salt mist	None					9
Chemically active substances	chlorine	Cl ₂ (mg/m ³)	0,1/0,3	None					9
		HCl (mg/m ³)	0,1/0,5	None					9
	nitrogen	NO _x (mg/m ³)	0,5/1,0	None					9
		NH ₃ (mg/m ³)	1,0/3,0	None					9
	hydrogen fluoride	HF (mg/m ³)	0,01/0,03	None					9
	ozone	O ₃ (mg/m ³)	0,05/0,1	None					9
Mechanically active substances	dust	Sedimentation (mg/(m ² h))	1,5	None					10
		suspension (mg/m ³)	0,2	None					10
	sand	(mg/m ³)	30	None					10
Flora and Fauna	micro organisms		negligible						
	rodents, insects		negligible						
<p>Legenda: no = this condition does not occur in this class.</p> <p>NOTE 1: (Air temperature, high) Two test temperatures are given. The lower temperature shall apply if the equipment is protected against solar radiation.</p> <p>NOTE 2: The characteristic severity value is considered to have insignificant effect on the equipment and therefore no test is required.</p> <p>NOTE 3: (Humidity, relative high) These severities are the nearest IEC test temperature values, which according to the climatogram can be achieved in the relative humidity given in the table. This test is recommended for unpacked equipment only.</p> <p>NOTE 4: This characteristic severity corresponds to the high value of relative humidity and small temperature variation within the equipment and is considered to be covered by test IEC 60068-2-78 [11] Test Cab. Therefore, no additional tests are required.</p> <p>NOTE 5: This effect is considered to be partly included in test IEC 60068-2-78 [11] Test Cab and/or test IEC 60068-2-30 [10] Test Db. Therefore, no additional tests are required.</p> <p>NOTE 6: (Air pressure, low and high) No test is required at equipment level or on sub-assemblies of it, because the effect of air pressure is evaluated at the component level.</p> <p>NOTE 7: The characteristic severity value is considered to have insignificant effect on the equipment in storage conditions and furthermore there is no IEC test method for this parameter, therefore no test is required.</p> <p>NOTE 8: (Radiation, solar, heat)The heating effect of solar radiation is included in the higher test temperature in IEC 60068-2-2 [5] Test Bb as described in note 2. Photochemical tests can be made separately for components and materials. No test is required in the present document.</p> <p>NOTE 9: (Chemically active substances) Characteristic severities are mean/maximum values. The characteristic severities should be considered when choosing components and materials. No test is required in the present document.</p> <p>NOTE 10: (Mechanically active substances) For mechanically active substances the packaging is supposed to protect the equipment against dust and sand where needed, therefore no test is required. Furthermore, the levels of dust, both sedimentation and suspension, are far lower than the lowest severity recommended in IEC 60068-2-68 [i.2] Test Lb.</p>									

Table 2: Test specification T 1.1: Weatherprotected, partly temperature-controlled storage locations - mechanical tests

Environmental parameter			Environmental Class 1.1	Environmental test specification T 1.1: Weatherprotected, partly temperature-controlled storage locations						
Type	Parameter	Detail parameter	Characteristic severity	Test severity		Duration	Reference	Method	Performance criteria	Notes
Vibration	sinusoidal	velocity (mm/s)	1,5	5		3 x 5 sweep cycles	IEC 60068-2-6 [6]	Fc: Vibration (sinusoidal)	A	1
		displacement (mm)		5	5 - 62					
		acceleration (m/s ²)	2 - 9	9 - 200						
		frequency range (Hz)								
		axes of vibration								
	random	ASD (m ² /s ³)		0,02		3 x 30 minutes	IEC 60068-2-64 [12]	Fh: Vibration, broad-band random (digital control)	A	2
		(dB/oct)		+12	-12					
		frequency range (Hz)		5 - 10; 10 - 50; 50 - 100						
		axes of vibration								
Shocks	shocks	shock spectrum	Type L	None						3
		duration (ms)	22							
		acceleration (m/s ²)	40							
		number of shocks								
		directions of shocks								
Load	static load	(kPa)	5	None						4

Legenda: no = this condition does not occur in this class.

NOTE 1: (Vibration, sinusoidal) The characteristic severities are given as peak values. The test severity values defined for this phenomenon are not specified in IEC 60068-2-6 [6].

NOTE 2: (Vibration, random) ASD (Acceleration Spectral Density). Random vibration testing method may be used instead of the sinusoidal vibration test. The test severity values are not specified in IEC 60068-2-64 [12]. The maximum test frequency has been reduced because between 100 Hz and 200 Hz the contribution is insignificant.

	classes: 1.1 and 1.2	class: 1.3
Acceleration RMS (for information only)	1,06 m/s ²	1,5 m/s ²

NOTE 3: (Shocks) No test is required because this condition is covered by transportation test for packaged equipment and by in-use test for unpackaged equipment.

NOTE 4: (Load) Packaging and/or equipment should be designed taking into account this requirement but no tests are required.

4.4 Specification T 1.2: Weatherprotected, not temperature-controlled storage locations

The specifications in tables 3 and 4 shall apply to weatherprotected or partially weatherprotected storage locations having neither temperature nor humidity control described in ETSI EN 300 019-1-1 [1].

Table 3: Test specification T 1.2: Weatherprotected, not temperature-controlled storage locations - climatic tests

Environmental parameter			Environmental Class 1.2	Environmental test specification T1.2: Weatherprotected, not temperature-controlled storage locations					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criterion	Notes
	low	(°C)	-25	-25	72 h	IEC 60068-2-1 [4]	Ab: Cold	A	
Air	high	(°C)	+55	+55 or +70	72 h	IEC 60068-2-2 [5]	Bb: Dry heat	A	1
temperature	change	(°C/min)	0,5	None					2
	low	(%)	10	None					8
	relative	high (%) (°C)	100	93 +30	96 h	IEC 60068-2-78 [11]	Cab: Damp heat steady state	A	3
Humidity		condensation (%) (°C)	yes	90-100 +30	2 cycles	IEC 60068-2-30 [10]	Db: Damp heat cyclic Variant 1	A	5
	absolute	low (g/m ³)	0,5	None					8
		high (g/m ³)	29	None					4
	pressure	low (kPa)	70	None					7
Air		high (kPa)	106	None					7
	speed	(m/s)	30	None					8
	rain	intensity	no						
Water		low temperature	no						
	other sources		dripping water	None					6
	icing & frosting		yes	None					8
Radiation	solar	(W/m ²)	1 120	None					9
	heat	(W/m ²)	600	None					9

Environmental parameter			Environmental Class 1.2	Environmental test specification T1.2: Weatherprotected, not temperature-controlled storage locations					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criterion	Notes
	sulphur	SO ₃ (mg/m ³)	0,3/1,0	None					10
		H ₂ S (mg/m ³)	0,1/0,5	None					10
		salts	sea and road salt mist	None					10
Chemically	chlorine	Cl ₂ (mg/m ³)	0,1/0,3	None					10
Active		HCl (mg/m ³)	0,1/0,5	None					10
substances	nitrogen	NO _x (mg/m ³)	0,5/1,0	None					10
		NH ₃ (mg/m ³)	1,0/3,0	None					10
	hydrogen fluoride	HF (mg/m ³)	0,01/0,03	None					10
	ozone	O ₃ (mg/m ³)	0,05/0,1	None					10
Mechanically	dust	sedimentation (mg/(m ² h))	20	None					11
Active		suspension (mg/m ³)	5,0	None					11
substances	sand	(mg/m ³)	300	None					11
Flora and	micro organisms		mould, fungus, etc.	None					12
Fauna	rodents, insects		rodents, etc.	None					12

Legenda: no = this condition does not occur in this class.

NOTE 1: (Air temperature, high) Two test temperatures are given. The lower temperature shall apply if the equipment is protected against solar radiation.

NOTE 2: The characteristic severity value is considered to have insignificant effect on the equipment and therefore no test is required.

NOTE 3: (Humidity, relative high) These severities are the nearest IEC test temperature values, which according to the climogram can be achieved in the relative humidity given in the table. This test is recommended for unpacked equipment only.

NOTE 4: This characteristic severity corresponds to the high value of relative humidity and small temperature variation within the equipment and is considered to be covered by test IEC 60068-2-78 [11] Test Cab. Therefore, no additional tests are required.

NOTE 5: (Humidity, relative, condensation) IEC 60068-2-30 [10] Test Db is recommended with test severities not higher than climogram limits for this class.

NOTE 6: This effect is considered to be partly included in test IEC 60068-2-78 [11] Test Cab and/or test IEC 60068-2-30 [10] Test Db. Therefore, no additional tests are required.

NOTE 7: (Air pressure, low and high) No test is required at equipment level or on sub-assemblies of it, because the effect of air pressure is evaluated at the component level.

NOTE 8: The characteristic severity value is considered to have insignificant effect on the equipment in storage conditions and furthermore there is no IEC test method for this parameter, therefore no test is required.

NOTE 9: (Radiation, solar, heat) The heating effect of solar radiation is included in the higher test temperature in IEC 60068-2-2 [5] Test Bb as described in note 2. Photochemical tests can be made separately for components and materials. No test is required in the present document.

NOTE 10: (Chemically active substances) Characteristic severities are mean/maximum values. The characteristic severities should be considered when choosing components and materials. No test is required in the present document.

NOTE 11: (Mechanically active substances) For mechanically active substances the packaging is supposed to protect the equipment against dust and sand where needed, therefore no test is required. Furthermore, the levels of dust, both sedimentation and suspension, are far lower than the lowest severity recommended in IEC 60068-2-68 [i.2] Test Lb.

NOTE 12: (Flora and fauna) The characteristic severities should be considered when choosing components and materials but no test is required at the equipment level.

Table 4: Test specification T 1.2: Weatherprotected, not temperature-controlled storage locations - mechanical tests

Environmental parameter			Environmental Class 1.2	Environmental test specification T1.2: Weatherprotected not temperature-controlled storage locations						
Type	Parameter	Detail parameter	Characteristic Severity	Test severity		Duration	Reference	Method	Performance criteria	Notes
Vibration	sinusoidal	velocity (mm/s)	1,5	5			IEC 60068-2-6 [6]	Fc: Vibration (sinusoidal)	A	1
		displacement (mm)		5	2					
		acceleration (m/s ²)		2 - 9	9 - 200					
		frequency range (Hz)		5 - 62	62 - 200	3 x 5 sweep cycles				
		axes of vibration		3						
	random	ASD (m ² /s ³)		0,02			IEC 60068-2-64 [12]	Fh: Vibration, broad-band random (digital control)	A	2
		(dB/oct)		+12	-12	3 x 30 minutes				
		frequency range (Hz)		5 - 10;	10 - 50;	50 - 100				
		axes of vibration		3						
Shocks	shocks	shock spectrum	Type L							3
		duration (ms)	22	None						
		acceleration (m/s ²)	40							
		number of shocks								
		directions of shocks								
Load	static load	(kPa)	5	None						4

Legenda: no = this condition does not occur in this class.

NOTE 1: (Vibration, sinusoidal) The characteristic severities are given as peak values. The test severity values defined for this phenomenon are not specified in IEC 60068-2-6 [6].

NOTE 2: (Vibration, random) ASD (Acceleration Spectral Density). Random vibration testing method may be used instead of the sinusoidal vibration test. The test severity values are not specified in IEC 60068-2-64 [12]. The maximum test frequency has been reduced because between 100 Hz and 200 Hz the contribution is insignificant.

	classes: 1.1 and 1.2	class: 1.3
Acceleration RMS (for information only)	1,06 m/s ²	1,5 m/s ²

NOTE 3: (Shocks) No test is required because this condition is covered by transportation test for packaged equipment and by in-use test for unpackaged equipment.

NOTE 4: (Load) Packaging and/or equipment should be designed taking into account this requirement but no tests are required.

4.5 Specification T 1.3: Non-weatherprotected storage locations and T 1.3 E: Non-weatherprotected storage locations - extended

The specifications in tables 5 to 7 shall apply to storage locations which are not protected from direct weather influences described in ETSI EN 300 019-1-1 [1].

Table 5: Test specification T 1.3: Non-weatherprotected storage locations - climatic tests

Environmental parameter			Environmental Class 1.3	Environmental test specification T1.3: Non-weatherprotected, storage locations					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
	low	(°C)	-33	-33 or -45	72 h	IEC 60068-2-1 [4]	Ab: Cold	A	1
Air	high	(°C)	+40	+55 or +40	72 h	IEC 60068-2-2 [5]	Bb: Dry heat	A	2
temperature	change	(°C) (°C/min)	0,5	-10/+40 0,5	2 cycles t1 = 3 h	IEC 60068-2-14 [7]	Nb: Change of temperature	A	3
		low (%)	15	None					8
	relative	high (%) (°C)	100	93 +30	21 d	IEC 60068-2-78 [11]	Cab: Damp heat steady state	A	4
Humidity		condensation (%) (°C)	Yes	90-100 +30	6 cycles	IEC 60068-2-30 [10]	Db: Damp heat cyclic Variant 1	A	5
	absolute	low (g/m ³)	0,26	None					8
		high (g/m ³)	25	None					6
	pressure	low (kPa)	70	None					7
Air		high (kPa)	106	None					7
	speed	(m/s)	50	None					8
	rain	intensity (mm/min) (m ³ /min) (kPa)	6	0,01 90	3 min/m ² or 15 min	IEC 60068-2-18 [8]	Rb: Impacting water, Method 1.2 "spray nozzle"	A	9
Water		low temperature (°C)	+5	None					9
	other sources		splashing water	None					10
	icing & frosting		yes	None					8

Environmental parameter			Environmental Class 1.3	Environmental test specification T1.3: Non-weatherprotected, storage locations					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Radiation	solar	(W/m ²)	1 120	None					11
	heat	(W/m ²)	negligible	None					11
	sulphur	SO ₂	(mg/m ³)	0,3/1,0	None				
H ₂ S		(mg/m ³)	0,1/0,5	None					12
salts			sea and road salt mist	None					12
Chemically active substances	chlorine	Cl ₂	(mg/m ³)	0,1/0,3	None				12
		HCl	(mg/m ³)	0,1/0,5	None				12
	nitrogen	NO _x	(mg/m ³)	0,5/1,0	None				12
		NH ₃	(mg/m ³)	1,0/3,0	None				12
	hydrogen fluoride	HF	(mg/m ³)	0,01/0,03	None				12
	ozone	O ₃	(mg/m ³)	0,05/0,1	None				12
Mechanically active substances	dust	sedimentation	(mg/(m ² h))	20	None				13
		suspension	(mg/m ³)	5,0	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

Environmental parameter			Environmental Class 1.3	Environmental test specification T1.3: Non-weatherprotected, storage locations					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
no = this condition does not occur in this class.									
NOTE 1: (Air temperature, low) The lower test temperature has been chosen to represent the conditions where the unpacked equipment is exposed to extreme low temperatures and heat irradiation.									
NOTE 2: (Air temperature, high) Two test temperatures are given. The lower temperature shall apply if the equipment is protected against solar radiation.									
NOTE 3: (Air temperature, change) In cold temperatures rapid change of temperature is not likely to occur during storage. Test Nb is intended for equipment with large thermal time constant.									
NOTE 4: (Humidity, relative high) These severities are the nearest IEC test temperature values, which according to the climatogram can be achieved in the relative humidity given in the table. This test is recommended for unpacked equipment only.									
NOTE 5: (Humidity, relative, condensation) IEC 60068-2-30 [10] Test Db is recommended with test severities not higher than climatogram limits for this class.									
NOTE 6: This effect is considered to be partly included in test IEC 60068-2-78 [11] Test Cab and/or test IEC 60068-2-30 [10] Test Db. Therefore, no additional tests are required.									
NOTE 7: (Air pressure, low and high) No test is required at equipment level or on sub-assemblies of it, because the effect of air pressure is evaluated at the component level.									
NOTE 8: The characteristic severity value is considered to have insignificant effect on the equipment in storage conditions and furthermore there is no IEC test method for this parameter, therefore no test is required.									
NOTE 9: (Water, rain) IEC 60068-2-18 [8] Test Rb method 1.2 "spray nozzle" has been chosen even if it does not represent normal rain. It is a simple hand held shower test, easy to perform and it is suitable to demonstrate that the package design is adequate to survive this condition. The cooling effect of the low temperature of the rain is included in IEC 60068-2-14 [7] Test Nb. Two durations are given, whichever is greater should be chosen.									
NOTE 10: (Water, other sources) No test is required because the effect is already included in IEC 60068-2-18 [8] Test Rb.									
NOTE 11: (Radiation, solar, heat) The heating effect of solar radiation is included in the higher test temperature in IEC 60068-2-2 [5] Test Bb as described in note 2. Photochemical tests can be made separately for components and materials. No test is required in the present document.									
NOTE 12: (Chemically active substances) Characteristic severities are mean/maximum values. The characteristic severities should be considered when choosing components and materials. No test is required in the present document.									
NOTE 13: (Mechanically active substances) For mechanically active substances the packaging is supposed to protect the equipment against dust and sand where needed, therefore no test is required. Furthermore, the levels of dust, both sedimentation and suspension, are far lower than the lowest severity recommended in IEC 60068-2-68 [i.2] Test Lb.									
NOTE 14: (Flora and fauna) The characteristic severities should be considered when choosing components and materials but no test is required at the equipment level.									

Table 6: Test specification T 1.3 E: Non-weatherprotected storage locations - extended - climatic tests

Environmental parameter			Environmental Class 1.3E	Environmental test specification T1.3E: Non-weatherprotected, storage locations - extended					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
	low	(°C)	-45	-45	72 h	IEC 60068-2-1 [4]	Ab: Cold	A	
Air temperature	high	(°C)	+45	+45 or +60	72 h	IEC 60068-2-2 [5]	Bb: Dry heat	A	1
	change	(°C) (°C/min)	0,5	-10/+40 0,5	2 cycles $t_1 = 3h$	IEC 60068-2-14 [7]	Nb: Change of temperature	A	2
		low (%)	8	None				A	7
	relative	high (%) (°C)	100	93 +30	21 d	IEC 60068-2-78 [11]	Cab: Damp heat steady state	A	3
Humidity		condensation (%) (°C)	yes	90-100 +40	6 cycles	IEC 60068-2-30 [10]	Db: Damp heat cyclic Variant 1	A	4
	absolute	low (g/m ³)	0,03	None					7
		high (g/m ³)	30	None					5
	pressure	low (kPa)	70	None					6
Air		high (kPa)	106	None					6
	speed	(m/s)	50	None					7
Water	rain	intensity (mm/min) (m ³ /min) (kPa)	15	0,01 90	6 min/m ² or 30 min	IEC 60068-2-18 [8]	Rb: Impacting water, Method 1.2 "spray nozzle"	A	8
		low temperature (°C)	+5	None					8
	other sources		splashing water	None					9
	icing & frosting		yes	None					7
Radiation	solar	(W/m ²)	1 120	None					10
	heat	(W/m ²)	negligible						

Environmental parameter			Environmental Class 1.3E	Environmental test specification T1.3E: Non-weatherprotected, storage locations - extended					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
	sulphur	SO ₂ (mg/m ³)	0,3/1,0	None					11
		H ₂ S (mg/m ³)	0,1/0,5	None					11
		salts	sea and road salt mist	None					11
Chemically active substances	chlorine	Cl ₂ (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
	ozone	O ₃ (mg/m ³)	0,05/0,1	None					11
Mechanically active substances	dust	sedimentation (mg/(m ² h))	20	None					12
		suspension (mg/m ³)	5,0	None					12
	sand	(mg/m ³)	300	None					12
Flora and Fauna	micro organisms		mould, fungus, etc.	None					13
	rodents, insects		rodents, etc.	None					13

Environmental parameter			Environmental Class 1.3E	Environmental test specification T1.3E: Non-weatherprotected, storage locations - extended					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
<p>Legenda: no = this condition does not occur in this class.</p> <p>NOTE 1: (Air temperature, high) Two test temperatures are given. The lower temperature shall apply if the equipment is protected against solar radiation.</p> <p>NOTE 2: (Air temperature, change) In cold temperatures rapid change of temperature is not likely to occur during storage. Test Nb is intended for equipment with large thermal time constant.</p> <p>NOTE 3: (Humidity, relative high) These severities are the nearest IEC test temperature values, which according to the climogram can be achieved in the relative humidity given in the table. This test is recommended for unpacked equipment only.</p> <p>NOTE 4: (Humidity, relative, condensation) IEC 60068-2-30 [10] Test Db is recommended with test severities not higher than climogram limits for this class.</p> <p>NOTE 5: This effect is considered to be partly included in test IEC 60068-2-78 [11] Test Cab and/or test IEC 60068-2-30 [10] Test Db. Therefore, no additional tests are required.</p> <p>NOTE 6: (Air pressure, low and high) No test is required at equipment level or on sub-assemblies of it, because the effect of air pressure is evaluated at the component level.</p> <p>NOTE 7: The characteristic severity value is considered to have insignificant effect on the equipment in storage conditions and furthermore there is no IEC test method for this parameter, therefore no test is required.</p> <p>NOTE 8: (Water, rain) IEC 60068-2-18 [8] Test Rb method 1.2 "spray nozzle" has been chosen even if it does not represent normal rain. It is a simple hand held shower test, easy to perform and it is suitable to demonstrate that the package design is adequate to survive this condition. The cooling effect of the low temperature of the rain is included in IEC 60068-2-14 [7] Test Nb. Two durations are given, whichever is greater should be chosen.</p> <p>NOTE 9: (Water, other sources) No test is required because the effect is already included in IEC 60068-2-18 [8] Test Rb.</p> <p>NOTE 10: (Radiation, solar, heat) The heating effect of solar radiation is included in the higher test temperature in IEC 60068-2-2 [5] Test Bb as described in note 2. Photochemical tests can be made separately for components and materials. No test is required in the present document.</p> <p>NOTE 11: (Chemically active substances) Characteristic severities are mean/maximum values. The characteristic severities should be considered when choosing components and materials. No test is required in the present document.</p> <p>NOTE 12: (Mechanically active substances) For mechanically active substances the packaging is supposed to protect the equipment against dust and sand where needed, therefore no test is required. Furthermore, the levels of dust, both sedimentation and suspension, are far lower than the lowest severity recommended in IEC 60068-2-68 [i.2] Test Lb.</p> <p>NOTE 13: (Flora and fauna) The characteristic severities should be considered when choosing components and materials but no test is required at the equipment level.</p>									

Table 7: Test specification T 1.3: Non-weatherprotected storage locations and test specification T 1.3 E: Non-weatherprotected storage locations - extended - mechanical tests

Environmental parameter			Environmental Class 1.3 & 1.3E	Environmental test specification T 1.3 and T 1.3E: Non-weatherprotected storage locations					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Vibration	sinusoidal	displacement (mm)	3,0	1,2		IEC 60068-2-6 [6]	Fc: Vibration (sinusoidal)		1
		acceleration (m/s ²)	10	4					
		frequency range (Hz)	2-9 9-200	5 - 9 9 - 200	3 x 5 sweep cycles				
		axes of vibration		3					
	random	ASD (m ² /s ³)		0,04		IEC 60068-2-64 [12]	Fh: Vibration, broad-band random (digital control)		2
		(dB/oct)		+12 -12					
		frequency range (Hz)		5 - 10; 10 - 50; 50 - 100	3 x 30 minutes				
		axes of vibration		3					
Shocks	shocks	shock spectrum	Type I	half sine		IEC 60068-2-27 [9]	Ea: Shock		3
		duration (ms)	11	11					
		acceleration (m/s ²)	100	50					
		number of shocks			3 in each direction				
		directions of shocks		6					
Load	static load	(kPa)	5	None					4

Legenda: no = this condition does not occur in this class.

NOTE 1: (Vibration, sinusoidal) The characteristic severities are given as peak values. The test severity values defined for this phenomenon are not specified in IEC 60068-2-6 [6].

NOTE 2: (Vibration, random) ASD (Acceleration Spectral Density). Random vibration testing method may be used instead of the sinusoidal vibration test. The test severity values are not specified in IEC 60068-2-64 [12]. The maximum test frequency has been reduced because between 100 Hz and 200 Hz the contribution is insignificant.

	classes: 1.1 and 1.2	class: 1.3
Acceleration RMS (for information only)	1,06 m/s ²	1,5 m/s ²

NOTE 3: (Shocks) The test can be omitted for packaged equipment if this condition is covered by transportation tests. The values for test severity are not specified in IEC 60068-2-27 [9]. The characteristic severities are given as peak values. The energy content and the Shock Response Spectrum (SRS) of the shock given as test severity have been considered more appropriate than that given by the characteristic severity.

NOTE 4: (Load) Packaging and/or equipment should be designed taking into account this requirement but no tests are required.

Annex A (informative): Bibliography

ETSI TR 100 035: "Equipment Engineering (EE); Environmental engineering; Guidance and terminology".

IEC 60068-1: "Environmental testing. Part 1: General and guidance".

History

Document history		
Edition 1	May 1994	Publication as ETSI ETS 300 019-2-1
V2.1.2	September 2000	Publication
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