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Foreword

This multi-part European Telecommunication Standard (ETS) has been produced by the Equipment Engineering (EE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETS 300 019 is concerned with environmental conditions and environmental tests for telecommunications equipment and comprises two main parts, each with subdivisions:

- ETS 300 019-1: "Classification of environmental conditions".

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

- ETS 300 019-2: "Specification of environmental tests".

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

Part 2-0 forms a general overview of Part 2. This part (Part 2-1), deals with storage locations.

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1 Scope

This European Telecommunication Standard (ETS) specifies test severities and methods for verification of the required resistibility of equipment according to the relevant environmental class.

The tests defined in Part 2-1 of this multi-part standard apply to storage of equipment covering the environmental conditions stated in ETS 300 019-1-1 [1].

2 Normative references

This ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 019-1-1: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 1-1: Classification of environmental conditions; Storage".

[2] IEC 68-2: "Environmental testing Part 2: Tests".

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

3 Environmental test specifications

The detailed descriptions of the environmental conditions are given in Clauses 4 and 5 of ETS 300 019-1-1 [1].

ETS 300 019-2-0 [3] forms a general overview of Part 2 of this ETS.

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

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

This specification applies to partly temperature-controlled storage locations. Humidity is not usually controlled. See tables 1 and 2.

Table 1: Test specification T 1.1: Weatherprotected, partly temperature-controlled storage locations - climatic 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
Air temperature	low	(°C)	-5	-5	72 h	IEC 68-2-1	Ab: Cold
	high	(°C)	+45	+45 (1) or +55	72 h	IEC 68-2-2	Bb: Dry heat
	change	(°C/min)	0,5	none			
Humidity	relative	low (%)	5	none (6)			
		high (%) (°C)	95	93 (8) +30	4 d	IEC 68-2-56	Cb: Damp heat steady state
		condensation	yes	none			
	absolute	low (g/m^3)	1	none (4) (6)			
		high (g/m^3)	29	(7)			
Air	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	1	none			
Water	rain	intensity	no				
		low temperature	no				
	other sources		no				
	icing & frosting		yes	(6)			
Radiation	solar	(W/m^2)	700	(2)			
	heat	(W/m^2)	600	(2)			

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Table 1 (concluded): Test specification T 1.1: Weatherprotected, partly temperature-controlled storage locations - climatic 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
Chemically active sub-stances	sulphur	SO_2 (mg/m^3)	0,3/1,0 (3)	none (5)			
		H_2S (mg/m^3)	0,1/0,5 (3)	none (5)			
	chlorine	salts	sea and road salt mist	none (5)			
		Cl_2 (mg/m^3)	0,1/0,3 (3)	none (5)			
		HCl (mg/m^3)	0,1/0,5 (3)	none (5)			
	nitrogen	NO_x (mg/m^3)	0,5/1,0 (3)	none (5)			
		NH_3 (mg/m^3)	1,0/3,0 (3)	none (5)			
	hydrogen fluoride HF	(mg/m^3)	0,01/0,03 (3)	none (5)			
	ozone O_3	(mg/m^3)	0,05/0,1 (3)	none (5)			
Mechanically active substances	dust	sedimentation ($mg/(m^2\ h)$)	1,5	none (6)			
		suspension (mg/m^3)	0,2	none (6)			
	sand	(mg/m^3)	30	none (6)			
Flora and Fauna	micro organisms		negligible				
	rodents, insects		negligible				

no = this condition does not occur in this class. (n) = NOTE (n = number of note), see subclause 3.4.
none = verification is required only in special cases.

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
Vibration	sinusoidal	velocity (mm/s) displacement (19) (mm) acceleration (19) (m/s^2) freq. range (Hz) axes of vibration	 1,5 5 2-9 9-200	5 2 5-62 62-200 3 axes	 3 x 5 sweep cycles	IEC 68-2-6	Fc: Vibration (sinusoidal)
Shocks	shocks	shock spectrum duration (ms) acceleration (m/s^2) number of shocks directions of shocks	Type L 22 40	 none			
Fall	free fall	height (mm) mass (kg) attitude	no				
	drop and topple	height (mm) angle (deg) edges	no				
Acceleration, Load	steady state static load	(kPa)	no 5	none (4)			

no = this condition does not occur in this class. (n) = NOTE (n = number of note), see subclause 3.4.
none = verification is required only in special cases.

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

This specification applies to weatherprotected or partially weatherprotected storage locations having neither temperature nor humidity control. See tables 3 and 4.

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

Environmental parameter			Environmental Class 1.2	Environmental test specification T 1.2: Weatherprotected, not temperature-controlled storage locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-25	-25	72 h	IEC 68-2-1	Ab: Cold
	high	(°C)	+55	+55 (1) or +70	72 h	IEC 68-2-2	Bb: Dry heat
	change	(°C/min)	0,5	none			
Humidity	relative	low (%)	10	none (6)			
		high (%) (°C)	100	93 +30 (8)	4 d	IEC 68-2-56	Cb: Damp heat steady state
		condensation (%) (°C)	yes	 90-100 +30 (8)	2 cycles	IEC 68-2-30	Db: Damp heat cyclic Variant 1
	absolute	low (g/m^3)	0,5	none (4) (6)			
		high (g/m^3)	29	(7) (9)			
Air	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	30	none			
Water	rain	intensity	no				
		low temperature	no				
	other sources		dripping water	(9)			
	icing & frosting		yes	none (6)			
Radiation	solar	(W/m^2)	1120	(2)			
	heat	(W/m^2)	600	(2)			

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

Environmental parameter			Environmental Class 1.2	Environmental test specification T 1.2: Weatherprotected, not temperature-controlled storage locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Chemically active sub-stances	sulphur	SO_2 (mg/m^3)	0,3/1,0 (3)	none (5)			
		H_2S (mg/m^3)	0,1/0,5 (3)	none (5)			
	chlorine	salts	sea and road salt mist	none (5)			
		Cl_2 (mg/m^3)	0,1/0,3 (3)	none (5)			
		HCl (mg/m^3)	0,1/0,5 (3)	none (5)			
	nitrogen	NO_x (mg/m^3)	0,5/1,0 (3)	none (5)			
		NH_3 (mg/m^3)	1,0/3,0 (3)	none (5)			
	hydrogen fluoride HF	(mg/m^3)	0,01/0,03 (3)	none (5)			
	ozone O_3	(mg/m^3)	0,05/0,1 (3)	none (5)			
Mechanically active substances	dust	sedimentation ($mg/(m^2\ h)$)	20	none (6)			
		suspension ($mg/(m^3)$)	5,0	none (6)			
	sand	(mg/m^3)	300	none (6)			
Flora and Fauna	micro organisms		mould, fungus, etc.	none (5)			
	rodents, insects		rodents, etc.	none (5)			

no = this condition does not occur in this class.
none = verification is required only in special cases.
(n) = NOTE (n = number of note), see subclause 3.4.

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

Environmental parameter			Environmental Class 1.2	Environmental test specification T 1.2: Weatherprotected, not temperature-controlled storage locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Vibration	sinusoidal	velocity (19) (mm/s) displacement (19) (mm) acceleration (19) (m/s^2) freq. range (Hz) axes of vibration	 1,5 5 2-9 9-200	5,0 2 5-62 62-200 3 axes	3 x 5 sweep cycles	IEC 68-2-6	Fc: Vibration (sinusoidal)
Shocks	shocks	shock spectrum duration (ms) acceleration (19) (m/s^2) number of shocks directions of shocks	Type L 22 40	none			
Fall	free fall	height (mm) mass (kg) attitude	no				
	drop and topple	height (mm) angle (deg) edges	no				
Acceleration, Load	steady state static load	(kPa)	no 5	none (4)			

no = this condition does not occur in this class.
(n) = NOTE (n = number of note), see subclause 3.4.
none = verification is required only in special cases.

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

This specification applies to storage locations which are not protected from direct weather influences. See tables 5 to 8.

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

Environmental parameter			Environmental Class 1.3	Environmental test specification T 1.3: Non-weatherprotected, storage locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-33	-33 (15) or -45 (10)	72 h	IEC 68-2-1	Ab: Cold
	high	(°C)	+40	+55 or +40 (11)	72 h	IEC 68-2-2	Bb: Dry heat
	change	(°C) (°C/min)	 0,5	-10/+40 0,5 (13) (15)	2 cycles t1 = 3 h	IEC 68-2-14	Nb: Change of temperature
Humidity	relative	low (%)	15	none (6)			
		high (%) (°C)	100	93 +30 (8)	21 d	IEC 68-2-56	Cb: Damp heat steady state
		condensation (%) (°C)	yes	 90-100 +30	6 cycles	IEC 68-2-30	Db: Damp heat cyclic, Variant 1
	absolute	low (g/m^3)	0,26	none (4) (6)			
		high (g/m^3)	25	(16)			
Air	pressure	low (kPa) high (kPa)	70 106	none none			
	speed	(m/s)	50	none			
Water	rain	intensity (mm/min) (m^3/min) (kPa)	6	 10^{-2} 90	 3 min/m^2 or 15 min (17)	IEC 68-2-18	Rb:Impacting water, Method 2.2
		low temperature (°C)	+5	(14)			
	other sources		splashing water	(12)			
	icing & frosting		yes	none (6)			
Radiation	solar	(W/m^2)	1120	(2)			
	heat	(W/m^2)	negligible				

(continued)

Table 5 (concluded): Test specification T.1.3: Non-weatherprotected storage locations - climatic tests

Environmental parameter			Environmental Class 1.3	Environmental test specification T 1.3: Non-weatherprotected, storage locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Chemically active sub-stances	sulphur	SO_2 (mg/m^3)	0,3/1,0 (3)	none (5)			
		H_2S (mg/m^3)	0,1/0,5 (3)	none (5)			
	chlorine	salts	sea and road salt mist	none (5)			
		Cl_2 (mg/m^3)	0,1/0,3 (3)	none (5)			
		HCl (mg/m^3)	0,1/0,5 (3)	none (5)			
	nitrogen	NO_x (mg/m^3)	0,5/1,0 (3)	none (5)			
		NH_3 (mg/m^3)	1,0/3,0 (3)	none (5)			
	hydrogen fluoride HF	(mg/m^3)	0,01/0,03 (3)	none (5)			
	ozone O_3	(mg/m^3)	0,05/0,1 (3)	none (5)			
Mechanically active substances	dust	sedimentation ($mg/(m^2h)$)	20,0	none (6)			
		suspension (mg/m^3)	5,0	none (6)			
	sand	(mg/m^3)	300	none (6)			
Flora and Fauna	micro organisms		mould, fungus etc.	none (5)			
	rodents, insects		rodents etc.	none (5)			

no = this condition does not occur in this class. (n) = NOTE (n = number of note), see subclause 3.4.
none = verification is required only in special cases.

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

Environmental parameter			Environmental Class 1.3E	Environmental test specification T 1.3E: Non-weatherprotected, storage locations - extended			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-45	-45 (18)	72 h	IEC 68-2-1	Ab: Cold
	high	(°C)	+45	+45 (11) or +60 (15)	72 h	IEC 68-2-2	Bb: Dry heat
	change	(°C) (°C/min)	 0,5	-10/+40 0,5 (13) (15)	2 cycles t_1 = 3 h	IEC 68-2-14	Nb: Change of temperature
Humidity	relative	low (%)	8	none (6)			
		high (%) (°C)	100	93 +30 (8)	21 d	IEC 68-2-56	Cb: Damp heat steady state
		condensation (%) (°C)	yes	 90-100 +40	6 cycles	IEC 68-2-30	Db: Damp heat cyclic Variant 1
	absolute	low (g/m^3)	0,03	none (4) (6)			
		high (g/m^3)	30	(16)			
Air	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	50	none			
Water	rain	intensity (mm/min) (m^3/min) (kPa)	15	 10^{-2} 90	6 min/m^2 or 30 min (17)	IEC 68-2-18	Rb:Impacting water, Method 2.2
		low temperature (°C)	+5	(14)			
	other sources		splashing water	(12)			
	icing & frosting		yes	none (6)			
Radiation	solar	(W/m^2)	1120	(2)			
	heat	(W/m^2)	negligible				

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

Environmental parameter			Environmental Class 1.3E	Environmental test specification T 1.3E: Non-weatherprotected, storage locations - extended			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Chemically active sub-stances	sulphur	SO_2 (mg/m^3)	0,3/1,0 (3)	none (5)			
		H_2S (mg/m^3)	0,1/0,5 (3)	none (5)			
	chlorine	salts	sea and road salt mist	none (5)			
		Cl_2 (mg/m^3)	0,1/0,3 (3)	none (5)			
		HCl (mg/m^3)	0,1/0,5 (3)	none (5)			
	nitrogen	NO_x (mg/m^3)	0,5/1,0 (3)	none (5)			
		NH_3 (mg/m^3)	1,0/3,0 (3)	none (5)			
	hydrogen fluoride HF	(mg/m^3)	0,01/0,03 (3)	none (5)			
	ozone O_3	(mg/m^3)	0,05/0,1 (3)	none (5)			
Mechanically active substances	dust	sedimentation ($mg/(m^2\ h)$)	20	none (6)			
		suspension (mg/m^3)	5,0	none (6)			
	sand	(mg/m^3)	300	none (6)			
Flora and Fauna	micro organisms		mould, fungus etc.	none (5)			
	rodents, insects		rodents etc.	none (5)			

no = this condition does not occur in this class. (n) = NOTE (n = number of note), see subclause 3.4.
none = verification is required only in special cases.

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
Vibration	sinusoidal	displacement (19) (mm) acceleration (19) (m/s^2) freq. range (Hz) axes of vibration	3,0 10 2-9 9-200	1,5 (20) 5 (20) 5-9 9-200 3 axes	 3 x 5 sweep cycles	IEC 68-2-6	Fc: Vibration (sinusoidal)
Shocks	shocks	shock spectrum duration (ms) acceleration (19) (m/s^2) number of shocks directions of shocks	Type I 11 100	half sine 6 100 6	 3 in each direction	IEC 68-2-27	Ea: Shock
Fall	free fall	height (mm) mass (kg) attitude	no				
	drop and topple	height (mm) angle (deg) edges	no				
Acceleration Load	steady state static load	(kPa)	no 5	none (4)			

no = this condition does not occur in this class. (n) = NOTE (n = number of note), see subclause 3.4.
none = verification is required only in special cases.

Table 8: Test specification T 1.3: Non-weatherprotected storage locations and test specification T 1.3 E: Non-weatherprotected storage locations - extended - special mechanical tests (IEC class 1M4)

Environmental parameter			Environmental Class 1.3 & 1.3E	Environmental test specification T 1.3 and T 1.3E: Special mechanical tests, IEC class 1M4.			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Vibration	sinusoidal	displacement (19) (mm) acceleration (19) (m/s^2) freq. range (Hz) axes of vibration	7,0 20 2-9 9-200	1,5 (20) 5 (20) 5-9 9-200 3 axes	3 x 5 sweep cycles	IEC 68-2-6	Fc: Vibration (sinusoidal)
Shocks	shocks	shock spectrum duration (ms) acceleration (19) (m/s^2) mass (kg) number of shocks directions of shocks	Type II 6 250 no	half sine 6 6 250 100 ≤ 100 >100 6 (21)	3 in each direction	IEC 68-2-27	Ea: Shock
Fall	free fall	height (mm) mass (kg) attitude	no				
	drop and topple	height (mm) angle (deg) edges	no				
Acceleration Load	steady state static load	(kPa)	no 5	none (4)			

no = this condition does not occur in this class.
none = verification is required only in special cases.
(n) = NOTE (n = number of note), see subclause 3.4.

3.4 Notes to tables 1 to 8

NOTE 1: If the equipment is protected against the effects of solar and heat radiation.

NOTE 2: The heating effect on equipment is covered by test Bb. Photochemical tests for material can be made separately.

NOTE 3: Mean/maximum value.

NOTE 4: Relevant parameter - packaging and/or equipment should be designed with this requirements in mind.

NOTE 5: The characteristics severities should be considered when choosing components and materials. Therefore, no tests are required at the equipment level.

NOTE 6: No suitable tests exist in IEC 68-2 [2].

NOTE 7: This is covered by test Cb: Damp heat, steady state.

NOTE 8: Test required for unpackaged equipment only.

NOTE 9: The wetting effect is included in test Db.

NOTE 10: If the equipment is unpackaged, or not protected against heat irradiation.

NOTE 11: If the equipment is protected against the effects of solar radiation.

NOTE 12: This effect is included in test Rb.

NOTE 13: Intended for items with a large thermal time constant. For equipment where the rapid change of temperature of the surface has a significant effect on internal components, values up to 5°C/minute can be applied (e.g. heat sinks).

NOTE 14: The cooling effect is included in test Nb.

NOTE 15: Value not specified in IEC 68-2 [2].

NOTE 16: This is covered by tests Cb and Db.

NOTE 17: Whichever is greater.

NOTE 18: The temperature may be lower to take into account the night irradiation if the equipment is unpackaged or not protected against heat radiation.

NOTE 19: Peak value.

NOTE 20: Lower test severity has been chosen because the characteristic severity is unlikely to occur.

NOTE 21: If the shocks in some directions are known to be insignificant, then tests need not be performed in those directions.

Annex A (informative): Bibliography

The following references are used for informative purposes within this ETS.

ETR 035: "Equipment Engineering (EE); Environmental engineering; Guidance and terminology".

IEC 68-1: "Environmental testing Part 1: General and guidance".

History

Document history	
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