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Contents

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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 2-7), deals with portable and non-stationary use.

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1 Scope

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

The tests defined in Part 2-7 of this multi-part standard apply to portable and non-stationary use of equipment, covering the environments stated in ETS 300 019-1-7 [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 300 019-1-7: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 1-7: Classification of environmental conditions; Portable and non-stationary use".

[2] IEC 68-2: "Basic environmental testing procedures. 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 300 019-1-7 [1].

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

The equipment under test is assumed to be in its operational state throughout the test conditions described in this Part unless otherwise stated. The required performance before, during and after the test needs to be specified in the product specification. Input and load conditions of the equipment shall be chosen to obtain full utilisation of the equipment under test. The heat dissipation shall be maximised, except for the steady state, low temperature test, where it shall be minimised.

3.1 Specification T 7.1: Temperature-controlled locations

This specification applies to use at, and direct transfer between, permanently temperature-controlled enclosed locations where humidity is usually not controlled. See tables 1, 5 and 6.

Table 1: Test specification T 7.1: Temperature-controlled locations - climatic tests

Environmental parameter			Environmental Class 7.1	Environmental test specification T 7.1: Portable, temperature-controlled locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	+5	+5 (7)	16 h	IEC 68-2-1	Ab/Ad: Cold (6)
	high	(°C)	+40	+40 (1) or +50 (17)	16 h	IEC 68-2-2	Bb/Bd: Dry heat
	change	(°C)	+5/+25	+5/+25 (9)	3 cycles t_1 = 3 h	IEC 68-2-14	Na: Change of temperature
Humidity	relative	low (%)	5	(2) (8)			
		high (%) (°C)	85	85 +30	4 d	IEC 68-2-56	Cb: Damp heat steady state
		condensation (%) (°C)	yes	90-100 +30	2 cycles	IEC 68-2-30	Db: Damp heat cyclic, variant 1
	absolute	low (g/m^3)	1	none (2) (8)			
		high (g/m^3)	25	(10)			
Air	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	5,0	none			
Water	rain	intensity	no				
		low temperature	no				
	other sources		no				
	icing & frosting		no				
Radiation	solar	(W/m^2)	700	(3)			
	heat	(W/m^2)	600	(3)			

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Table 1 (concluded): Test specification T 7.1: Temperature-controlled locations - climatic tests

Environmental parameter			Environmental Class 7.1	Environmental test specification T 7.1: Portable, temperature-controlled 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 (4)	none (5)			
		H_2S (mg/m^3)	0,1/0,5 (4)	none (5)			
	chlorine	salts	sea and road salt mist	none (5)			
		Cl_2 (mg/m^3)	0,1/0,3 (4)	none (5)			
		HCl (mg/m^3)	0,1/0,5 (4)	none (5)			
	nitrogen	NO_x (mg/m^3)	0,5/1,0 (4)	none (5)			
		NH_3 (mg/m^3)	1,0/3,0 (4)	none (5)			
	hydrogen fluoride HF	(mg/m^3)	0,01/0,03 (4)	none (5)			
	ozone O_3	(mg/m^3)	0,05/0,1 (4)	none (5)			
Mechanically active substances	dust	sedimentation ($mg/(m^2\ h)$)	1,5	(2)			
		suspension (mg/m^3)	0,2	(2)			
	sand	(mg/m^3)	30	(2)			
Flora and Fauna	micro organisms		no				
	rodents, insects		no				

no = this condition does not occur in this class. (n) = NOTE (n = number of note), see subclause 3.5.
none = verification is required only in special cases.

3.2 Specification T 7.2: Partly temperature-controlled locations

This specification applies to use at and direct transfer between, enclosed locations having neither temperature nor humidity control but where heating may be used to avoid low temperatures. Building construction avoids extremely high temperatures. See tables 2, 5 and 6.

Table 2: Test specification T 7.2: Partly temperature-controlled locations - climatic tests

Environmental parameter			Environmental Class 7.2	Environmental test specification T 7.2: Portable, partly temperature-controlled locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-5	-5 (7)	16 h	IEC 68-2-1	Ab/Ad: Cold (6)
	high	(°C)	+45	+45 (1) or +55	16 h	IEC 68-2-2	Bb/Bd: Dry heat
	change	(°C)	-5/+25	-5/+25 (9)	3 cycles t_1 = 3 h	IEC 68-2-14	Na: Change of temperature
Humidity	relative	low (%)	5	(2) (8)			
		high (%) (°C)	95	93 +30	4 d	IEC 68-2-56	Cb: Damp heat steady state
		condensation (%) (°C)	yes	90-100 +30	2 cycles	IEC 68-2-30	Db: Damp heat cyclic, variant 1
	absolute	low (g/m^3)	1	none (2) (8)			
		high (g/m^3)	29	(10)			
Air	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	5,0	none			
Water	rain	intensity	no				
		low temperature	no				
	other sources		dripping water	none (16)			
	icing & frosting		yes	none			
Radiation	solar	(W/m^2)	700	(3)			
	heat	(W/m^2)	600	(3)			

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Table 2 (concluded): Test specification T 7.2: Partly temperature-controlled locations - climatic tests

Environmental parameter			Environmental Class 7.2	Environmental test specification T 7.2: Portable, temperature-controlled 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 (4)	none (5)			
		H_2S (mg/m^3)	0,1/0,5 (4)	none (5)			
	chlorine	salts	sea and road salt mist	none (5)			
		Cl_2 (mg/m^3)	0,1/0,3 (4)	none (5)			
		HCl (mg/m^3)	0,1/0,5 (4)	none (5)			
	nitrogen	NO_x (mg/m^3)	0,5/1,0 (4)	none (5)			
		NH_3 (mg/m^3)	1,0/3,0 (4)	none (5)			
	hydrogen fluoride HF	(mg/m^3)	0,01/0,03 (4)	none (5)			
	ozone O_3	(mg/m^3)	0,05/0,1 (4)	none (5)			
Mechanically active substances	dust	sedimentation ($mg/(m^2\ h)$)	20	(2)			
		suspension (mg/m^3)	5,0	(2)			
	sand	(mg/m^3)	300	(2)			
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 3.5.

3.3 Specification T 7.3: Partly weatherprotected and non-weatherprotected locations

This specification applies to use at totally or partly weatherprotected locations of such construction that extremely low temperatures are avoided and to use at non-weatherprotected locations and to transfer between these locations. During cold seasons non-weatherprotected use and transfer is limited. See tables 3, 5 and 6.

Table 3: Test specification T 7.3: Partly weatherprotected and non-weatherprotected locations - climatic tests

Environmental parameter			Environmental Class 7.3	Environmental test specification T 7.3: Portable, partly weatherprotected and non-weatherprotected, locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-25	-25 (7)	16 h	IEC 68-2-1	Ab/Ad: Cold (6)
	high	(°C)	+70	+70 and +85 (19)	16 h	IEC 68-2-2	Bb/Bd: Dry heat
	change	(°C)	-25/+30	-25/+30 (9)	3 cycles t_1 = 3 h	IEC 68-2-14	Na: Change of temperature
Humidity	relative	low (%)	5	(2) (8)			
		high (%) (°C)	100	93 +40	4 d	IEC 68-2-56	Cb: Damp heat steady state
		condensation (%) (°C)	yes	90-100 +40	2 cycles	IEC 68-2-30	Db: Damp heat cyclic, variant 1
	absolute	low (g/m^3)	0,5	none (2) (8)			
		high (g/m^3)	48	(10)			
Air	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	30	none			
Water	rain	intensity (mm/min) volume (m^3/min) pressure (kPa)	6	0,01 90	1 min/m^2 or 5 min (18)	IEC 68-2-18	Rb: Impacting water, method 2.2
		low temperature (°C)	+5	none			
	other sources icing & frosting		dripping water yes	none (11) none			
Radiation	solar	(W/m^2)	1120	(3)			
	heat	(W/m^2)	600	(3)			

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Table 3 (concluded): Test specification T 7.3: Partly weatherprotected and non-weatherprotected locations - climatic tests

Environmental parameter			Environmental Class 7.3	Environmental test specification T 7.3: Portable, partly weatherprotected and non-weatherprotected 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 (4)	none (5)			
		H_2S (mg/m^3)	0,1/0,5 (4)	none (5)			
	chlorine	salts	sea and road salt mist	none (5)			
		Cl_2 (mg/m^3)	0,1/0,3 (4)	none (5)			
		HCl (mg/m^3)	0,1/0,5 (4)	none (5)			
	nitrogen	NO_x (mg/m^3)	0,5/1,0 (4)	none (5)			
		NH_3 (mg/m^3)	1,0/3,0 (4)	none (5)			
	hydrogen fluoride HF	(mg/m^3)	0,01/0,03 (4)	none (5)			
	ozone O_3	(mg/m^3)	0,05/0,1 (4)	none (5)			
Mechanically active substances	dust	sedimentation (mg/(m^2 h))	20	(2)			
		suspension (mg/m^3)	5,0	(2)			
	sand	(mg/m^3)	300	(2)			
Flora and	micro organisms		mould, fungus, etc.	none (5)			
Fauna	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 3.5.

3.4 Specification T 7.3E: Partly weatherprotected and non-weatherprotected locations - extended

This specification applies to use at totally or partly weatherprotected locations of any construction (except at Extremely Cold and and Cold Climates where extremely low temperatures shall be avoided) and to use at non-weatherprotected locations and to transfer between these locations. During extremely cold seasons non-weatherprotected use and transfer is limited. See tables 4, 5 and 6.

Table 4: Test specification T 7.3E: Partly weatherprotected and non-weatherprotected locations - extended - climatic tests

Environmental parameter			Environmental Class 7.3E	Environmental test specification T 7.3E: Portable, partly weatherprotected and non-weatherprotected locations - extended			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-40	-40 (7)	16 h	IEC 68-2-1	Ab/Ad: Cold (6)
	high	(°C)	+70	+70 and +85 (19)	16 h	IEC 68-2-2	Bb/Bd: Dry heat
	change	(°C)	-40/+30	-40/+30 (9)	3 cycles t_1 = 3 h	IEC 68-2-14	Na: Change of temperature
Humidity	relative	low (%)	5	(2) (8)			
		high (%) (°C)	100	93 +40	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)	0,1	none (2) (8)			
		high (g/m^3)	62	(12)			
Air	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	30	none			
Water	rain	intensity (mm/min) volume (m^3/min) pressure (kPa)	6	0,01 90	1 min/m^2 or 5 min (18)	IEC 68-2-18	Rb: Impacting water, method 2.2
		low temperature (°C)	+5	none			
	other sources icing & frosting		dripping water yes	(11) none			
Radiation	solar	(W/m^2)	1120	(3)			
	heat	(W/m^2)	600	(3)			

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Table 4 (concluded): Test specification T 7.3E: Partly weatherprotected and non-weatherprotected locations - extended - climatic tests

Environmental parameter			Environmental Class 7.3E	Environmental test specification T 7.3E: Portable, Partly weatherprotected, and non-weatherprotected 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 (4)	none (5)			
		H_2S (mg/m^3)	0,1/0,5 (4)	none (5)			
	chlorine	salts	sea and road salt mist	none (5)			
		Cl_2 (mg/m^3)	0,1/0,3 (4)	none (5)			
		HCl (mg/m^3)	0,1/0,5 (4)	none (5)			
	nitrogen	NO_x (mg/m^3)	0,5/1,0 (4)	none (5)			
		NH_3 (mg/m^3)	1,0/3,0 (4)	none (5)			
	hydrogen fluoride HF	(mg/m^3)	0,01/0,03 (4)	none (5)			
	ozone O_3	(mg/m^3)	0,05/0,1 (4)	none (5)			
Mechanically active substances	dust	sedimentation ($mg/(m^2\,h)$)	20	(2)			
		suspension (mg/m^3)	5,0	(2)			
	sand	(mg/m^3)	300	(2)			
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 3.5.
none = verification is required only in special cases.

Table 5: Test specification T 7.1 to T 7.3E: Mechanical tests

Environmental parameter			Environmental Class 7.1 to 7.3E	Environmental test specification T 7.1 to 7.3E: Portable. (IEC 721 class 7M2)			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Vibration	sinusoidal	displacement (13) (mm) acceleration (13) (m/s^2) frequency range (Hz)	3,5 10 15 2-9 9- 200- 200 500	none			
	random	ASD (14) (m^2/s^3) (dB/oct) frequency range (Hz) axes of vibration	1,0 0,3 10-200 200-2000	0,96 -3 10-12 12-150 3 axes (22)	3 x 30 minutes	IEC 68-2-36	Fdb: Random vibration (wideband)
Shocks	shocks	shock spectrum duration (ms) acceleration (13) (m/s^2) number of shocks directions of shocks	Type I Type II 11 6 100 300	half sine 6 300 6	3 shocks in each direction (15)	IEC 68-2-27	Ea: Shock
	bump	acceleration (13) (m/s^2) duration (ms) number of bumps direction of bumps	no	150 6 6	500 bumps in each direction	IEC 68-2-29 (20)	Eb: Bump
Fall	free fall	height (m) mass (kg) attitude	0,25 0,1 0,05 ≤ 1 ≤ 10 ≤ 50	0,25 0,1 0,05 ≤ 1 ≤ 10 ≤ 50 each face	6 x 2 falls	IEC 68-2-32	Ed: Free fall procedure 1
	drop and topple	height (m) angle (deg) edges	no	0,1 30 bottom edges and corners	4 + 4 drops	IEC 68-2-31 (21)	Ec: Drop and topple procedures a and b
Acceleration, steady state				none			
Load, static load				none			

no = this condition does not occur in this class. (n) = NOTE (n = number of note), see subclause 3.5.
none = verification is required only in special cases.

Table 6: Test specifications T 7.1 to T 7.3E: Mechanical tests - alternative for classes 7.1 to 7.3E (IEC class 7M3)

Environmental parameter			Environmental Class 7.1 to 7.3E	Environmental test specification T 7.1 to 7.3E: Portable, alternative conditions (IEC 721 class 7M3).			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Vibration	sinusoidal	displacement (13) (mm) acceleration (13) (m/s^2) frequency range (Hz) axes of vibration	7.5 20 40 2-8 8- 200- 200 500	none			
	random	ASD (14) (m^2/s^3) (dB/oct) frequency range (Hz) axes of vibration	3,0 1,0 10-200 200-2000	1,92 -3 10-12 12-150 3 axes (22)	3 x 30 minutes	IEC 68-2-36	Fdb: Random vibration (wideband)
Shocks	shocks	shock spectrum duration (ms) acceleration (13) (m/s^2) number of shocks directions of shocks	Type I Type II 11 6 300 1000	half sine 6 1000 6	3 shocks in each direction (15)	IEC 68-2-27	Ea: Shock
	bump	acceleration (13) (m/s^2) duration (ms) number of bumps direction of bumps	no	250 6 6	500 bumps in each direction	IEC 68-2-29 (20)	Eb: Bump
Fall	free fall	height (m) mass (kg) attitude	1,0 0,5 0,25 ≤ 1 ≤ 10 ≤ 50	1,0 0,5 0,25 ≤ 1 ≤ 10 ≤ 50 each face	6 x 2 falls	IEC 68-2-32	Ed: Free fall procedure 1
	drop and topple	height (m) angle (deg) edges	no	0,1 30 bottom edges and corners	4 +4 drops	IEC 68-2-31 (21)	Ec: Drop and topple procedures a and b
Acceleration, steady state				none			
Load, static load				none			

no = this condition does not occur in this class. (n) = NOTE (n = number of note), see subclause 3.5.
none = verification is required only in special cases.

3.5 Notes to tables 1 to 6

NOTE 1: If protected against solar and heat radiation or if the equipment is ventilated (natural or forced).

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

NOTE 3: The heating effect on equipment is covered by test Bb/Bd.

NOTE 4: Mean/maximum value.

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

NOTE 6: The equipment under test shall remain operational throughout this test except for the cold start-up test which shall commence once low temperature stability is achieved.

NOTE 7: The cold start-up temperature may be modified by the product specification. The cold start-up temperature shall be declared whenever reference is made to conformance with any class from ETS 300 019.

NOTE 8: Relevant parameter. Equipment should be designed with this requirement in mind.

NOTE 9: Wherever possible, the equipment function shall be monitored throughout the test.

NOTE 10: This is covered by test Cb: Damp heat, steady state.

NOTE 11: This effect is covered by test Rb.

NOTE 12: This is partly covered by test Cb: Damp heat, steady state.

NOTE 13: Peak value.

NOTE 14: Acceleration Spectral Density.

NOTE 15: If the normal attitude is specified then the number of directions is reduced to 3.

NOTE 16: The wetting effect is included in test Db.

NOTE 17: Value not specified in IEC 68-2 [2].

NOTE 18: Whichever is greater.

NOTE 19: An additional test of 85 °C for 6 hours shall be conducted on equipment which has no protection against solar radiation.

NOTE 20: Bump test is recommended additional to shock test as the number of expected shocks is high.

NOTE 21: Drop and topple is recommended additional to free fall as the exact attitude of falling equipment under test cannot be specified.

NOTE 22: If the vibrations 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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