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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 2-6), deals with ship environments.

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1 Scope

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

The tests defined in Part 2-6 of this multi-part standard apply to the use of equipment installed permanently or temporarily in ships and cover the environments and the vessels stated in ETS 300 019-1-6 [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 300 019-1-6: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 1-6: Classification of environmental conditions; Ship environments".

[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 300 019-1-6 [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 6.1: Totally weatherprotected locations

This specification applies to a totally weatherprotected use in ships excluding Warm Damp and Warm Damp Equable climates, see tables 1 and 4.

Table 1: Test specification T 6.1: Totally weatherprotected locations - climatic tests

Environmental parameter			Environmental Class 6.1	Environmental test specification T 6.1: Ship, totally weatherprotected locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	+5	+5 (4)	16 h	IEC 68-2-1	Ab/Ad: Cold (3)
	high	(°C)	+40	+40	16 h	IEC 68-2-2	Bb/Bd: Dry heat
	change	air/water (°C)	no				
	surface	high (°C)	no				
Humidity	relative	low (%)	10	(5)			
		high; slow (%) temperature change (°C)	95 +30	93 +30	4 days	IEC 68-2-56	Cb: Damp heat steady state
		high; rapid (%) temperature change (°C)	no				
	absolute	high; rapid (g/m^3) temperature change	no				
Air	speed	(m/s)	no				
Water	temperature	high (°C)	30	none			
		low (°C)	no				
	rain	intensity (mm/min) volume (m^3/min) pressure (kPa)	no				
	other sources	velocity (m/s)	no				
	wetness		no				
Radiation	solar	(W/m^2)	no				
	heat	(W/m^2)	no				

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Table 1 (concluded): Test specification T 6.1: Totally weatherprotected locations - climatic tests

Environmental parameter			Environmental Class 6.1	Environmental test specification T 6.1: Ship, totally weatherprotected locations			
Type	Parameter-	Detail parameter-	Characteristic severity	Test severity	Duration	Reference	Method
Chemically active substances	sulphur	SO_2 (mg/m^3)	0,1 (1)	none (2)			
		H_2S (mg/m^3)	0,01 (1)	none (2)			
	chlorine	sea salts	negligible				
		HCl (mg/m^3)	0,1 (1)	none (2)			
	nitrogen	NO_x (mg/m^3)	0,1 (1)	none (2)			
		NH_3 (mg/m^3)	0,3 (1)	none (2)			
	hydrogen fluoride HF	(mg/m^3)	0,003 (1)	none (2)			
	ozone O_3	(mg/m^3)	0,01 (1)	none (2)			
Mechanically active substances	dust	sedimentation	negligible				
	sand in air		no				
	soot deposit		no				
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.

3.2 Specification T 6.2: Partly weatherprotected locations

This specification applies to use in ships excluding Cold Climate and extreme weather conditions, see tables 2, 4 and 5.

Table 2: Test specification T 6.2: Partly weatherprotected locations - climatic tests

Environmental parameter			Environmental Class 6.2	Environmental test specification T 6.2 : Ship, partly weatherprotected locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-25	-25 (4)	16 h	IEC 68-2-1	Ab/Ad: Cold (3)
	high	(°C)	+70	+70 or +85 (7)	16 h	IEC 68-2-2	Bb/Bd: Dry heat
	change	gradual (°C) (°C/min)	-25/+40 3	-25/+40 3 (6)	5 cycles t_1= 3 h	IEC 68-2-14	Nb: Change of temperature
	change	air/water (°C)	+40/+5	none (8)			
	surface	high (°C)	+70	none			
Humidity	relative	low (%)	10	none (5)			
		high; slow (%) temperature change (°C)	95 +45	93 +40	4 days	IEC 68-2-56	Cb: Damp heat steady state
		high; rapid (%) temperature change (°C)	95 -25/+35	none (5)			
	absolute	high; rapid (g/m^3) temperature change (°C) (%) (°C)	60 +70/+15	 90-100 +55	6 cycles	IEC 68-2-30	Db: Damp heat cyclic, variant 1
Air	speed	m/s	30	none (5)			
Water	temperature	high (°C)	+35	none (5)			
		low (°C)	freezing point	none (5)			
	rain	intensity (mm/min) volume (m^3/min) pressure (kPa)	6	 0,01 90	≥ 5 minutes	IEC 68-2-18	Rb: Impacting water method 2.2
	other sources	velocity (m/s)	3	none (5)			
	wetness		wet surfaces	none (9)			
Radiation	solar	(W/m^2)	1120	none (10) (11)			
	heat	(W/m^2)	1200	none (10)			

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Table 2 (concluded): Test specification T 6.2: Partly weatherprotected locations - climatic tests

Environmental parameter			Environmental Class 6.2	Environmental test specification T 6.2: Ship, partly weatherprotected locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Chemically active substances	sulphur	SO_2 (mg/m^3)	1,0 (1)	none (2)			
		H_2S (mg/m^3)	0,5 (1)	none (2)			
	chlorine	salt mist	yes	none (2)			
		sea salts (kg/m^3)	30 (1)	none (2)			
		HCl (mg/m^3)	0,5 (1)	none (2)			
	nitrogen	NO_x (mg/m^3)	1,0 (1)	none (2)			
		NH_3 (mg/m^3)	3,0 (1)	none (2)			
	hydrogen fluoride HF	(mg/m^3)	0,03 (1)	none (2)			
	ozone O_3	(mg/m^3)	0,1 (1)	none (2)			
Mechanically active substances	dust	sedimentation ($mg/(m^2h)$)	3,0	(5)			
	sand in air	(mg/m^3)	0,1	(5)			
	soot deposit		yes	(5)			
Flora and Fauna	micro organisms		mould, fungus etc.	none (2)			
	rodents, insects		rodents, etc.	none (2)			

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 6.3: Non-weatherprotected locations

This specification applies to normal unlimited use in ships, see tables 3, 4 and 5.

Table 3: Test specification T 6.3: Non weatherprotected locations - climatic tests

Environmental parameter			Environmental Class 6.3	Environmental test specification T 6.3 : Ship, non-weatherprotected locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-40	-40 (4)	16 h	IEC 68-2-1	Ab/Ad: Cold (3)
	high	(°C)	+70	+70 or +85 (7)	16 h	IEC 68-2-2	Bb/Bd: Dry heat
	change	gradual (°C) (°C/min)	-25/+40 3	-25/+40 3 (6)	5 cycles t_1= 3 h	IEC 68-2-14	Nb: Change of temperature
		air/water (°C)	+40/+5	none (8)			
	surface	high (°C)	+70	none			
Humidity	relative	low (%)	10	none (5)			
		high; slow (%) temperature change (°C)	95 +45	93 +40	21 days	IEC 68-2-56	Cb: Damp heat steady state
		high; rapid (%) temperature change (°C)	95 -25/+35	none (5)			
	absolute	high; rapid (g/m^3) temperature change (°C) (%) (°C)	60 +70/+15	 90-100 +55	 6 cycles	 IEC 68-2-30	 Db: Damp heat cyclic, variant 1
Air	speed	m/s	50	none (5)			
Water	temperature	high (°C)	+35	none (5)			
		low (°C)	freezing point	none (5)			
	rain	intensity (mm/min) volume (m^3/min) pressure (kPa)	15	 0,01 90	 ≥ 5 minutes	 IEC 68-2-18	 Rb: Impacting water method 2.2
	other sources	velocity (m/s)	10	none (5)			
	wetness		wet surfaces	none (9)			
Radiation	solar	(W/m^2)	1120	none (10) (11)			
	heat	(W/m^2)	1200	none (10)			

(continued)

Table 3 (concluded): Test specification T 6.3: Non weatherprotected locations - climatic tests

Environmental parameter			Environmental Class 6.3	Environmental test specification T 6.3: Ship, non-weatherprotected locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Chemically active substances	sulphur	SO_2 (mg/m^3)	1,0 (1)	none (2)			
		H_2S (mg/m^3)	0,5 (1)	none (2)			
	chlorine	salt mist	yes	none (2)			
		sea salts (kg/m^3)	30 (1)	none (2)			
		HCl (mg/m^3)	0,5 (1)	none (2)			
	nitrogen	NO_x (mg/m^3)	1,0 (1)	none (2)			
		NH_3 (mg/m^3)	3,0 (1)	none (2)			
	hydrogen fluoride HF	(mg/m^3)	0,03 (1)	none (2)			
	ozone O_3	(mg/m^3)	0,1 (1)	none (2)			
Mechanically active substances	dust	sedimentation ($mg/(m^2h)$)	3,0	(5)			
	sand in air	(mg/m^3)	0,1	(5)			
	soot deposit		yes	(5)			
Flora and Fauna	micro organisms rodents, insects		mould, fungus etc. rodents, etc.	none (2) none (2)			

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 4: Test specification T 6.1 to T 6.3: Ship locations - mechanical tests (IEC class 6M3)

Environmental parameter			Environmental Class 6.1 to 6.3	Environmental test specification T 6.1 to 6.3: Ship locations.			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Vibration	sinusoidal (16)	displacement (12) (mm) acceleration (12) (m/s^2) frequency range (Hz) axes of vibration	1,5 20 2-18 18-200	1,5 19,6 5-18 18-200 3 axes	3x10 sweep cycles (18)	IEC 68-2-6	Fc: vibration (sinusoidal)
	sinusoidal (17)	displacement (12) (mm) acceleration (12) (m/s^2) frequency range (Hz) axes of vibration	1,5 20 2-18 18-200	1,0 7,0 2-13,2 13,2-80 3 axes	3x10 sweep cycles (18)	IEC 68-2-6	Fc: vibration (sinusoidal)
Shocks	shocks	shock spectrum type duration (ms) acceleration (12) (m/s^2) mass (kg) shocks directions of shocks	I II III 11 6 2,3 100 300 500	half sine 6 300 ≥ 100 (13) 6	3 shocks in each direction	IEC 68-2-27	Ea: Shock
	bump	acceleration (12) (m/s^2) mass (kg) duration ms bumps direction of bumps	no	250 < 100 (13) 6 6	500 bumps in each direction	IEC 68-2-29	Eb: Bump
Acceleration, steady state		x-direction (12) (m/s^2) (surge) y-direction (12) (m/s^2) (sway) z-direction (12) (m/s^2) (heave)	5 6 10	none none none			
Angular motion	static	rotation around (deg) x-axis (list)	15	none			
		rotation around (deg) y-axis (trim)	10	none			
	dynamic	rotation around (deg) x-axis (roll) (Hz)	22,5 0,14	none			
		rotation around (deg) y-axis (pitch) (Hz)	10 0,2	none			
		rotation around (deg) z-axis (yaw) (Hz)	4 0,05	none			

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 5: Mechanical tests - Alternative for classes 6.2 and 6.3 (IEC class 6M4)

Environmental parameter			Environmental Class 6.2 to 6.3	Environmental test specification T 6.2 and 6.3 Ship locations; Alternative tests (IEC class 6M4).			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Vibration	sinusoidal	displacement (12) (mm) acceleration (12) (m/s^2) frequency range (Hz) axes of vibration	1,5 50 2-28 28-200	1,5 49 5-28 28-150 3 axes	3 x 10 sweep cycles (18)	IEC 68-2-6	Fc: Vibration (sinusoidal)
	random	ASD (14) (m^2/s^3) (dB/oct) frequency range (Hz) axes of vibration	no	19,2 -3 5-28 28-150 3 axes	3 x 30 min	IEC 68-2-36	Fdb: Random vibration,
Shocks	shocks	shock spectrum type duration (ms) acceleration (12) (m/s^2) mass (kg) shocks directions of shocks	I II III 11 6 2,3 100 300 500	half sine 6 300 ≥ 100 (13) 6 (15)	3 shocks in each direction	IEC 68-2-27	Ea: Shock
	bump	acceleration (12) (m/s^2) mass (kg) duration (ms) bumps direction of bumps		400 < 100 (13) 6 6	500 bumps in each direction	IEC 68-2-29	Eb: Bump
Acceleration, steady state		x-direction (12) (m/s^2) (surge) y-direction (12) (m/s^2) (sway) z-direction (12) (m/s^2) (heave)	5 6 10	none none none			
Angular motion	static	rotation around x-axis (list)	15	none			
		rotation around y-axis (trim) (deg)	10	none			
	dynamic	rotation around x-axis (roll) (deg) (Hz)	22,5 0,14	none			
		rotation around y-axis (pitch) (deg) (Hz)	10 0,2	none			
		rotation around z-axis (yaw) (deg) (Hz)	4 0,05	none			

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.

3.4 Notes to tables 1 to 5

NOTE 1: Maximum value.

NOTE 2: The characteristic severities should be considered when choosing components and materials. Therefore no tests are required at the equipment level.

NOTE 3: 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 4: 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 in-use class from ETS 300 019.

NOTE 5: No suitable test exists in IEC 68-2 [2].

NOTE 6: The equipment function shall be monitored throughout the test.

NOTE 7: Includes heat-trap effect and effect of direct solar radiation on equipment.

NOTE 8: This effect is included in test Nb.

NOTE 9: This effect is included in test Db.

NOTE 10: The heating effect on equipment is covered by test Bb/Bd.

NOTE 11: Photochemical tests for materials can be made separately.

NOTE 12: Peak value.

NOTE 13: Shock to a hull is most likely to be perceived by the equipment as bump. A shock test is specified for equipment · 100 kg as this is the most practical test.

NOTE 14: Acceleration Spectral Density.

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

NOTE 16: Test severity covers all types of vessels in any conditions.

NOTE 17: Test severity covers larger types of ship which do not navigate in ice.

NOTE 18: A 30 min endurance test shall be carried out at any significant resonant frequencies.

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	
May 1994	First Edition
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