

# ETSI EN 300 019-2-1 V2.1.2 (2000-09)

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*European Standard (Telecommunications series)*

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

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**Reference**

REN/EE-01024-2-1

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## Foreword

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

The present document is part 2, sub-part 1 of a multi-part EN covering the environmental conditions and environmental tests for telecommunications equipment, as identified below:

Part 1: "Classification of environmental conditions; Storage";

**Part 2: "Specification of environmental tests; Storage".**

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.

<b>National transposition dates</b>	
Date of adoption of this EN:	23 June 2000
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# 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 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].

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] ETSI 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] ETSI 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] IEC 60068-2: "Environmental testing - Part 2: Tests".
- [4] IEC 60068-2-1: "Environmental testing - Part 2: Tests. Tests A: Cold".
- [5] IEC 60068-2-2: "Environmental testing - Part 2: Tests. Tests B: Dry heat".
- [6] IEC 60068-2-6: "Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)".
- [7] IEC 60068-2-14: "Environmental testing - Part 2: Tests. Test N: Change of temperature".
- [8] IEC 60068-2-18: "Environmental testing - Part 2: Tests. Test R and guidance: Water".
- [9] IEC 60068-2-27: "Environmental testing. Part 2: Tests. Test Ea and guidance: Shock".
- [10] IEC 60068-2-30: "Environmental testing - Part 2: Tests. Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)".
- [11] IEC 60068-2-56: "Environmental testing - Part 2: Tests. Test Cb: Damp heat, steady state, primarily for equipment".
- [12] IEC 60068-2-64: "Environmental testing - Part 2: Test methods - Test Fh: Vibration, broad-band random (digital control) and guidance".
- [13] IEC 60068-2-68: "Environmental testing - Part 2: Tests - Test L: Dust and sand".
- [14] IEC 60721-3-3: "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 3: Stationary use at weatherprotected locations".

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## 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 [2] forms a general overview of part 2 of the present document.

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

**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	Notes	
Air temperature	low	(°C)	-5	-5	72 h	IEC 60068-2-1 [4]	Ab: Cold		
	high	(°C)	+45	+45 or +55	72 h	IEC 60068-2-2 [5]	Bb: Dry heat	2	
	change	(°C/min)	0,5	none				3	
Humidity	relative	low	(%)	5	none			10	
		high	(%)	95	93	96 h	IEC 60068-2-56 [11]	Cb: Damp heat steady state	5
		condensation	(°C)	yes	none				6
	absolute	low	(g/m <sup>3</sup> )	1	none				10
		high	(g/m <sup>3</sup> )	29					8
Air	pressure	low	(kPa)	70	none			9	
		high	(kPa)	106	none			9	
	speed	(m/s)	1	none				10	
Water	rain	intensity		no					
		low temperature		no					
	other sources		no						
	icing & frosting		yes					10	
Radiation	solar	(W/m <sup>2</sup> )	700					13	
	heat	(W/m <sup>2</sup> )	600					13	

Table 1: Test specification T1.1: 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	Notes
Chemically active substances	sulphur	SO <sub>2</sub> (mg/m <sup>3</sup> )	0,3/1,0	none				14
		H <sub>2</sub> S (mg/m <sup>3</sup> )	0,1/0,5	none				14
	chlorine	salts	sea and road salt mist	none				14
		Cl <sub>2</sub> (mg/m <sup>3</sup> )	0,1/0,3	none				14
		HCl (mg/m <sup>3</sup> )	0,1/0,5	none				14
	nitrogen	NO <sub>x</sub> (mg/m <sup>3</sup> )	0,5/1,0	none				14
		NH <sub>3</sub> (mg/m <sup>3</sup> )	1,0/3,0	none				14
	hydrogen fluoride	HF (mg/m <sup>3</sup> )	0,01/0,03	none				14
	ozone	O <sub>3</sub> (mg/m <sup>3</sup> )	0,05/0,1	none				14
Mechanically active substances	dust	sedimentation (mg/(m <sup>2</sup> h))	1,5	none				15
		suspension (mg/m <sup>3</sup> )	0,2	none				15
	sand	(mg/m <sup>3</sup> )	30	none				15
Flora and Fauna	micro organisms		negligible					
	rodents, insects		negligible					
no = this condition does not occur in this class.				NOTE: (n = number of note), see subclause 4.2.				
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	Notes
Vibration	sinusoidal	velocity (mm/s)	1,5	5	3 x 5 sweep cycles	IEC 60068-2-6 [6]	Fc: Vibration (sinusoidal)	17
		displacement (mm)		2				
		acceleration (m/s <sup>2</sup> )	5	5-62	62-200			
		frequency range (Hz)	2-9 9-200					
		axes of vibration		3				
	random	ASD (m <sup>2</sup> /s <sup>3</sup> )		0,02	3 x 30 minutes	IEC 60068-2-64 [12]	Fh: Vibration, broad-band random (digital control)	18
		(dB/oct)		+12				
		frequency range (Hz)		5-10 10-50 50-100				
		axes of vibration		3				
Shocks	shocks	shock spectrum	Type L	none				19a
		duration (ms)	22					
		acceleration (m/s <sup>2</sup> )	40					
		number of shocks						
		directions of shocks						
Load	static load	(kPa)	5	none				20
no = this condition does not occur in this class.				NOTE (n = number of note), see subclause 4.2.				
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 T1.2: Weatherprotected, not temperature-controlled storage locations					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Notes	
Air temperature	low	(°C)	-25	-25	72 h	IEC 60068-2-1 [4]	Ab: Cold		
	high	(°C)	+55	+55 or +70	72 h	IEC 60068-2-2 [5]	Bb: Dry heat	2	
	change	(°C/min)	0,5	none				3	
Humidity	relative	low	(%)	10	none			10	
		high	(%)	100	93	96 h	IEC 60068-2-56 [11]	Cb: Damp heat steady state	5
		condensation	(°C)	yes	+30				7
	absolute	low	(g/m <sup>3</sup> )	0,5	90-100	2 cycles	IEC 60068-2-30 [10]	Db: Damp heat cyclic Variant 1	
		high	(g/m <sup>3</sup> )	29	+30				10
Air	pressure	low	(kPa)	70	none			9	
		high	(kPa)	106	none			9	
	speed	(m/s)	30	none				10	
Water	rain	intensity		no					
		low temperature		no					
	other sources		dripping water					8	
	icing & frosting		yes	none				10	
Radiation	solar	(W/m <sup>2</sup> )	1120					13	
	heat	(W/m <sup>2</sup> )	600					13	

**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	Notes
Chemically active substances	sulphur	SO <sub>3</sub> (mg/m <sup>3</sup> )	0,3/1,0	none				14
		H <sub>2</sub> S (mg/m <sup>3</sup> )	0,1/0,5	none				14
	chlorine	salts	sea and road salt mist	none				14
		Cl <sub>2</sub> (mg/m <sup>3</sup> )	0,1/0,3	none				14
		HCl (mg/m <sup>3</sup> )	0,1/0,5	none				14
	nitrogen	NO <sub>x</sub> (mg/m <sup>3</sup> )	0,5/1,0	none				14
		NH <sub>3</sub> (mg/m <sup>3</sup> )	1,0/3,0	none				14
	hydrogen fluoride	HF (mg/m <sup>3</sup> )	0,01/0,03	none				14
	ozone	O <sub>3</sub> (mg/m <sup>3</sup> )	0,05/0,1	none				14
Mechanically active substances	dust	sedimentation (mg/(m <sup>2</sup> h))	20	none				15
		suspension (mg/m <sup>3</sup> )	5,0	none				15
	sand	(mg/m <sup>3</sup> )	300	none				15
Flora and Fauna	micro organisms		mould, fungus, etc.	none				16
	rodents, insects		rodents, etc.	none				16
no = this condition does not occur in this class.				NOTE (n = number of note), see subclause 4.2.				
none = verification is required only in special cases.								

**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	Notes
Vibration	sinusoidal	velocity (mm/s)	1,5	5		3 x 5 sweep cycles	IEC 60068-2-6 [6]	Fc: Vibration (sinusoidal)	17
		displacement (mm)		5	2				
		acceleration (m/s <sup>2</sup> )	2-9	5-62	62-200				
		frequency range (Hz)	9-200	3					
		axes of vibration							
	random	ASD (m <sup>2</sup> /s <sup>3</sup> )		0,02		3 x 30 minutes	IEC 60068-2-64 [12]	Fh: Vibration, broad-band random (digital control)	18
		(dB/oct)		+12	-12				
		frequency range (Hz)	5-10	10-50	50-100				
		axes of vibration		3					
Shocks	shocks	shock spectrum	Type L						19a
		duration (ms)	22						
		acceleration (m/s <sup>2</sup> )	40	none					
		number of shocks							
		directions of shocks							
Load	static load	(kPa)	5	none					20
no = this condition does not occur in this class.			NOTE (n = number of note), see subclause 4.2.						
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 7.

**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	Notes	
Air temperature	low	(°C)	-33	-33 or -45	72 h	IEC 60068-2-1 [4]	Ab: Cold	1	
	high	(°C)	+40	+55 or +40	72 h	IEC 60068-2-2 [5]	Bb: Dry heat	2	
	change	(°C) (°C/min)	0,5	-10/+40 0,5	2 cycles t1 = 3 h	IEC 60068-2-14 [7]	Nb: Change of temperature	4	
Humidity	relative	low	(%)	15	none			10	
		high	(%) (°C)	100	93 +30	21 d	IEC 60068-2-56 [11]	Cb: Damp heat steady state	5
		condensation	(%) (°C)	yes	90-100 +30	6 cycles	IEC 60068-2-30 [10]	Db: Damp heat cyclic Variant 1	7
	absolute	low	(g/m <sup>3</sup> )	0,26	none				10
		high	(g/m <sup>3</sup> )	25					8
Air	pressure	low	(kPa)	70	none			9	
		high	(kPa)	106	none			9	
	speed	(m/s)	50	none				10	
Water	rain	intensity	(mm/min) (m <sup>3</sup> /min) (kPa)	6	0,01 90	3 min/m <sup>2</sup> or 15 min	IEC 60068-2-18 [8]	Rb: Impacting water, Method 2.2	11
		low temperature	(°C)	+5					11
	other sources		splashing water					12	
	icing & frosting		yes	none				10	
Radiation	solar	(W/m <sup>2</sup> )	1120					13	
	heat	(W/m <sup>2</sup> )	negligible					13	

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	Notes
Chemically active substances	sulphur	SO <sub>2</sub> (mg/m <sup>3</sup> )	0,3/1,0	none				14
		H <sub>2</sub> S (mg/m <sup>3</sup> )	0,1/0,5	none				14
	chlorine	salts	sea and road salt mist	none				14
		Cl <sub>2</sub> (mg/m <sup>3</sup> )	0,1/0,3	none				14
		HCl (mg/m <sup>3</sup> )	0,1/0,5	none				14
	nitrogen	NO <sub>x</sub> (mg/m <sup>3</sup> )	0,5/1,0	none				14
		NH <sub>3</sub> (mg/m <sup>3</sup> )	1,0/3,0	none				14
	hydrogen fluoride	HF (mg/m <sup>3</sup> )	0,01/0,03	none				14
ozone	O <sub>3</sub> (mg/m <sup>3</sup> )	0,05/0,1	none				14	
Mechanically active substances	dust	sedimentation (mg/(m <sup>2</sup> h))	20	none				15
		suspension (mg/m <sup>3</sup> )	5,0	none				15
	sand	(mg/m <sup>3</sup> )	300	none				15
Flora and Fauna	micro organisms		mould, fungus, etc.	none				16
	rodents, insects		rodents, etc.	none				16
no = this condition does not occur in this class.				NOTE (n = number of note), see subclause 4.2.				
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 T1.3E: Non-weatherprotected, storage locations - extended					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Notes	
Air temperature	low	(°C)	-45	-45	72 h	IEC 60068-2-1 [4]	Ab: Cold		
	high	(°C)	+45	+45 or +60	72 h	IEC 60068-2-2 [5]	Bb: Dry heat	2	
	change	(°C) (°C/min)	0,5	-10/+40 0,5	2 cycles t <sub>1</sub> = 3h	IEC 60068-2-14 [7]	Nb: Change of temperature	4	
Humidity	relative	low	(%)	8	none			10	
		high	(%) (°C)	100	93 +30	21 d	IEC 60068-2-56 [11]	Cb: Damp heat steady state	5
		condensation	(%) (°C)	yes	90-100 +40	6 cycles	IEC 60068-2-30 [10]	Db: Damp heat cyclic Variant 1	7
	absolute	low	(g/m <sup>3</sup> )	0,03	none				10
		high	(g/m <sup>3</sup> )	30					8
Air	pressure	low	(kPa)	70	none			9	
		high	(kPa)	106	none			9	
	speed	(m/s)	50	none				10	
Water	rain	intensity	(mm/min) (m <sup>3</sup> /min) (kPa)	15	0,01 90	6 min/m <sup>2</sup> or 30 min	IEC 60068-2-18 [8]	Rb: Impacting water, Method 2.2	11
		low temperature	(°C)	+5					11
	other sources		splashing water					12	
	icing & frosting		yes	none				10	
Radiation	solar	(W/m <sup>2</sup> )	1120					13	
	heat	(W/m <sup>2</sup> )	negligible						

Table 6: Test specification T.1.3E: 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	Notes
Chemically active substances	sulphur	SO <sub>2</sub> (mg/m <sup>3</sup> )	0,3/1,0	none				14
		H <sub>2</sub> S (mg/m <sup>3</sup> )	0,1/0,5	none				14
	chlorine	salts	sea and road salt mist	none				14
		Cl <sub>2</sub> (mg/m <sup>3</sup> )	0,1/0,3	none				14
		HCl (mg/m <sup>3</sup> )	0,1/0,5	none				14
	nitrogen	NO <sub>x</sub> (mg/m <sup>3</sup> )	0,5/1,0	none				14
		NH <sub>3</sub> (mg/m <sup>3</sup> )	1,0/3,0	none				14
	hydrogen fluoride	HF (mg/m <sup>3</sup> )	0,01/0,03	none				14
ozone	O <sub>3</sub> (mg/m <sup>3</sup> )	0,05/0,1	none				14	
Mechanically active substances	dust	sedimentation (mg/(m <sup>2</sup> h))	20	none				15
		suspension (mg/m <sup>3</sup> )	5,0	none				15
	sand	(mg/m <sup>3</sup> )	300	none				15
Flora and Fauna	micro organisms		mould, fungus, etc.	none				16
	rodents, insects		rodents, etc.	none				16
no = this condition does not occur in this class.				NOTE (n = number of note), see subclause 4.2.				
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	Notes
Vibration	sinusoidal	displacement (mm)	3,0	1,2			IEC 60068-2-6 [6]	Fc: Vibration (sinusoidal)	17
		acceleration (m/s <sup>2</sup> )	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 <sup>2</sup> /s <sup>3</sup> )		0,04			IEC 60068-2-64 [12]	Fh: Vibration, broad-band random (digital control)	18
		(dB/oct)		+12	-12				
		frequency range (Hz)		5-10	10-50	50-100			
		axes of vibration		3					
Shocks	shocks	shock spectrum	Type I	half sine			IEC 60068-2-27 [9]	Ea: Shock	19b
		duration (ms)	11	11					
		acceleration (m/s <sup>2</sup> )	100	50					
		number of shocks				3 in each direction			
		directions of shocks		6					
Load	static load	(kPa)	5	none					20

no = this condition does not occur in this class.  
none = verification is required only in special cases.

NOTE (n = number of note), see subclause 4.2.

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## 4 Notes to tables

### 4.1 General note

The present document applies to storage of equipment covering environmental conditions stated in ETS 300 019-1-1 [1]. The notes have been added to explain the main reasons for recommended tests or to explain why no test has been recommended even if there is a characteristic severity given.

The equipment should be tested in the state in which it is normally stored if possible. For example, if the equipment is in a packed state, then it should be tested in its packaging. If the equipment is stored both with and without its packaging it may be 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 Notes to tables 1 to 7

#### **NOTE 1.** (Air temperature, low)

The lower test temperature has been chosen to describe the conditions where the unpacked equipment has been exposed to extreme low temperatures and heat irradiation. If the equipment is tested without any package or if the equipment is small the duration may be decreased.

#### **NOTE 2.** (Air temperature, high)

Two test temperatures are given. The lower temperature applies if the equipment is protected against solar radiation. If the equipment is tested without any package or if the equipment is small the duration may be decreased.

#### **NOTE 3.**

The characteristic severity value is considered to have insignificant effect on the equipment and therefore no test is recommended.

#### **NOTE 4.** (Air temperature, change)

In cold temperatures rapid change of temperature are not likely to occur during storage. Test Nb is intended for specimen with large thermal time constant.

#### **NOTE 5.** (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 6.**

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 60068-2-56 [11] Test Cb.

#### **NOTE 7.** (Humidity, relative, condensation)

IEC 60068-2-30 [10] Test Db is recommended with test severities not higher than climatogram limits for this class.

#### **NOTE 8.**

This effect is considered to be partly included in test IEC 60068-2-56 [11] Test Cb and/or test IEC 60068-2-30 [10] Test Db.

#### **NOTE 9.** (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 10.**

There is no IEC 60068-2 [3] test method for this parameter.

**NOTE 11.** (Water, rain)

IEC 60068-2-18 [8] Test Rb method 2.2 has been chosen even if it does not imitate normal rain. It is a simple hand held shower test, easy to perform and can demonstrate that the specimen design is adequately toleranced to survive this condition. The cooling effect of the low temperature of the rain is included in IEC 60068-2 [3] Test Nb. Two durations are given, whichever is greater should be chosen.

**NOTE 12.** (Water, other sources)

No test is recommended because the effect is already included in IEC 60068-2 [3] Test Rb.

**NOTE 13.** (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 recommended in this standard.

**NOTE 14.** (Chemically active substances)

Characteristic severities are mean/maximum values. The characteristic severities should be considered when choosing components and materials. No test is recommended in this standard.

**NOTE 15.** (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 recommended. The levels of dust both sedimentation and suspension are far lower than the lowest severity recommended in IEC 60068-2-68 [13] Test Lb.

**NOTE 16.** (Flora and fauna)

The characteristic severities should be considered when choosing components and materials. Therefore not test is recommended at the equipment level.

**NOTE 17.** (Vibration, sinusoidal)

The severities are given as peak values. The characteristic severity given is considered to be too severe for this class. Test severity values not specified in IEC 60068-2 [3].

**NOTE 18.** (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 [3]. 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
<b>Acceleration RMS</b> (for information only)	1,06 m/s <sup>2</sup>	1,5 m/s <sup>2</sup>

**NOTE 19.** (Shocks)

**a.** No test is required because this condition is covered by transportation test for packaged equipment and by in-use test for unpackaged equipment.

**b.** 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 [3]. The 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 20.** (Load)

Packaging and/or equipment should be designed with this requirement in mind.

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## Bibliography

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

- ETR 035: "Equipment Engineering (EE); Environmental engineering; Guidance and terminology".
- IEC 60068-1: "Environmental testing. Part 1: General and guidance".

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## History

<b>Document history</b>		
Edition 1	May 1994	Publication as ETS 300 019-2-1
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