



EUROPEAN
TELECOMMUNICATION
STANDARD

DRAFT
pr **ETS 300 019-2-8**

July 1996

Source: ETSI TC-EE

Reference: DE/EE-01019-2-8

ICS: 33.020

Key words: environment, testing, underground

**Equipment Engineering (EE);
Environmental conditions and environmental tests for
telecommunications equipment;
Part 2-8: Specification of environmental tests**

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE

Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE

X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

*

Copyright Notification: No part may be reproduced except as authorized by written permission. The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 1996. All rights reserved.

Contents

Foreword 5

1 Scope 7

2 Normative references 7

3 Environmental test specifications 7

 3.1 Specification T 8.1: Partly weather-protected underground locations..... 7

4 Earthquake test specification 11

 4.1 Vibration response investigation 11

 4.2 Test conditioning..... 12

Annex A (informative): Bibliography 16

History..... 17

Blank page

Foreword

This multi-part draft European Telecommunication Standard (ETS) has been produced by the Equipment Engineering (EE) Technical Committee of the European Telecommunications Standards Institute (ETSI) and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

This ETS consists of 2 parts as follows:

Part 1: "Classification of environmental conditions".

Part 2: "Specification of environmental tests".

This standard is concerned with environmental conditions and environmental tests for telecommunications equipment and comprises two main parts, each with subdivisions:

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.

Sub-part 2-0 forms a general overview of part 2. This sub-part 2-8 deals with stationary use at underground locations.

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Blank page

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 in sub-part 2-8 of this multi-part standard apply to stationary use of equipment at underground locations covering the environmental conditions stated in prETS 300 019-1-8 [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] prETS 300 019-1-8: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-8: Classification of environmental conditions Stationary use at underground locations".
- [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 in clauses 4 and 5 of prETS 300 019-1-8 [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 8.1: Partly weather-protected underground locations

This specification applies to underground enclosures in footway boxes, manholes and some tunnels etc. which are protected from direct weather influences. The location has no temperature or humidity control, but the variations in the temperature are limited due to the stabilising influence of the surroundings. The equipment may be immersed in water during exceptional conditions.

Table 1: Test specification T 8.1: Partly weather-protected underground locations - climatic tests

Environmental parameter		Environmental Class 8.1		Environmental test specification T 8.1: In-use, partly weather-protected underground locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-10	-10	16 hours	IEC 68-2-1	Ab/Ad: Cold (1) (2)
	high	(°C)	+40	+40	16 hours	IEC 68-2-2	Bb/Bd: Dry heat
	change	(°C/minute) (°C)	5	-10/+40 (14)	2 cycles (3) t1 = 3 hours	IEC 68-2-14	Na: Rapid change of temperature (4)
Humidity	relative	low (%)	5	(5)			
		high (%)	100				
	condensation	(%)	yes	93	21 days	IEC 68-2-56	Cb: Damp heat steady state
		(°C)			90-100 +40	2 cycles	IEC 68-2-30
Air	absolute	low (g/m³)	0,5	(5)			
		high (g/m³)	23	(6)			
	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	1	none			
	rain	intensity		no	-		
low temperature			no	-			
Water	other sources		dripping water condensed wtr immersion to soil water	(7)			
		(m) (kPa)	yes	(7) 2 19,6	1 hour	IEC 68-2-17	Qf: Immersion
	icing & frosting		yes	(5)			
Radiation	solar heat	(W/m²)	no	-			
		(W/m²)	yes	(8)			

(continued)

Table 1 (concluded): Test specification T 8.1: Partly weather-protected underground locations - climatic tests

Environmental parameter			Environmental Class 8.1	Environmental test specification T 8.1: In-use, partly weather-protected underground locations				
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	
Chemically active substances	sulphur	SO ₂ (mg/m ³)	0,3/1,0 (9)	none (10)				
		H ₂ S (mg/m ³)	0,1/0,5 (9)	none (10)				
	chlorine	salt mist	sea and road salts		none (10)			
		Cl ₂ (mg/m ³)		0,1/0,3 (9)	none (10)			
	nitrogen	HCl (mg/m ³)		0,1/0,5 (9)	none (10)			
		NO _x (mg/m ³)		0,5/1,0 (9)	none (10)			
hydrogen fluoride	NH ₃ (mg/m ³)		1,0/3,0 (9)	none (10)				
		HF (mg/m ³)	0,01/0,03 (9)	none (10)				
	ozone	O ₃ (mg/m ³)	0,05/0,1 (9)	none (10)				
Mechanically active substances	dust	sedimentation (mg/(m ² hour))	15	none (11)				
		suspension (mg/m ³)	0,4	none (11)				
	sand		300	none (11)				
Flora and Fauna	micro organisms	mould, fungus, etc.		none (10)				
	rodents, insects			none (10)				
no = this condition does not occur in this class. none = verification is required only in special cases.							(n) = NOTE (n = number of note), see following table 2.	

Table 2: Test specification T 8.1: Partly weather-protected underground locations - mechanical tests

Environmental parameter		Environmental Class 8.1		Environmental test specification T 8.1: In-use, Partly weather-protected underground locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Referenc e	Method
Vibration IEC class 3M3 (15)	sinusoidal	velocity displacement (12) acceleration (12) frequency range axes of vibration	1,5 5 2-9 9-200	5 2 5-62 62-200 3 axes (13)	3 x 5 sweep cycles	IEC 68-2-6 (16)	Fc: Vibration (sinusoidal)
Shocks IEC class 3M3 (15)	shocks	shock spectrum duration acceleration (12) mass number of shocks directions of shocks	Type L 22 70	half-sine 11 6 100 50 ≤100 >100 6 (13)	3 in each dir.	IEC 68-2-27	Ea: Shock
Vibration IEC class 3M5 (15)	sinusoidal	displacement (12) acceleration (12) frequency range axes of vibration	3 10 2-9 9-200	3,5 10 5-9 9-200 3 axes (13)	3 x 5 sweep cycles	IEC 68-2-6	Fc: Vibration (sinusoidal)
Shocks IEC class 3M5 (15)	shocks	shock spectrum duration acceleration (12) mass number of shocks directions of shocks	Type II 6 250	half-sine 6 6 250 100 ≤100 >100 6 (13)	500 bumps in each direction	IEC 68-2-29	Eb: Bump
no = this condition does not occur in this class. none = verification is required only in special cases.							
(n) = NOTE (n = number of note), see next page.							

Notes to tables 1 and 2:

- NOTE 1: 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 2: The cold start-up temperature may be modified by the product specification.
- NOTE 3: Value not specified in IEC 68-2 [2].
- NOTE 4: The equipment function shall be monitored throughout the test.
- NOTE 5: No suitable tests exist in IEC 68-2 [2].
- NOTE 6: This is covered by test Db: Damp heat cyclic.
- NOTE 7: The wetting effect is included in test Qf: Immersion.
- NOTE 8: The heating effect on equipment of heat radiation from all sources is included in high temperature.
- NOTE 9: Mean/Maximum value.
- NOTE 10: The characteristic severities should be considered when choosing components and materials.
- NOTE 11: The immersion test will normally ensure compliance with the dust and sand requirement.
- NOTE 12: Peak value.
- NOTE 13: Equipment under test shall be mounted as for "in-use" (with any fixtures).
- NOTE 14: If preferred two tests may be carried out as follows: -10/+5 °C and +5/+40 °C.
- NOTE 15: At locations where the level of shock is high, e.g. in close vicinity of road traffic or adjacent to heavy machines, etc. special mechanical class 3M5 shall be chosen.
- NOTE 16: Value not specified in IEC 68-2 [2].

4 Earthquake test specification

If earthquake conditions are specified by the customer, the earthquake test requirements stated below shall be applied.

The test specification is applicable to class 8.1.

4.1 Vibration response investigation

A preliminary vibration response investigation shall be carried out to determine the lowest resonant frequency of the mounted test specimen.

The vibration response investigation can be carried out by means of sine sweep testing or random testing.

When using the sine sweep testing, the vibration response investigation shall be carried out in a manner based on that of IEC Publication 68-2 [2] subpart 6, with the following parameter severities:

- frequency range: 1 - 35 Hz;
- vibration amplitude: 2 m/s²;
- sweep rate: ≤ 1 octave/minute.

The vibration amplitude may be reduced to 1 m/s² or less in case of sharp resonances.

If a random test is used this shall be performed in accordance with the requirements of IEC Publication 68-2 [2] subpart 64, using the following severities:

Frequency range:	1 - 20 Hz	20 - 35 Hz;
ASD:	0,5 m ² /s ³	- 3 dB/octave.
Duration:	3 min.	

The Acceleration Spectral Density (ASD) value may be reduced to 0,3 m²/s³ or less in case of sharp resonances.

The time-history stated in table 3 can be omitted if, after the vibration response investigation, the equipment does not exhibit any resonance below 5 Hz and has passed the sinusoidal vibration test reported in table 2 for class 3M5, this test being sufficient to prove compliance with the earthquake conditions reported in ETS 300 019-1-8 [1].

4.2 Test conditioning

See table 3.

The extent to which the equipment under test has to function during tests or merely to survive conditions of test shall be stated in the product specification.

Table 3: Test specification T 8.1: Partly weather-protected underground locations - earthquake test

Environmental parameter		Environmental Class 8.1		Environmental test specification T 8.1: In-use, Partly weather-protected underground locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Earthquake	Time-history	RRS (1)	fig. 1 tab. 4	fig. 1 tab. 4		IEC 68-2-57	Ff: Time-history
		frequency range	1-35 Hz	1-35 Hz			
		ZPA (2)	5 m/s ²	5 m/s ²			
		axes		3 axes (3)(4)(5)	30 s (6)(7)(8)		
		damping ratio		2 %			

(See next page for notes to table.)

Notes to table 3:

NOTE 1: Required Response Spectrum.

NOTE 2: Zero Period Acceleration.

NOTE 3: The equipment under test mounted in the "in use" position. The testing configuration shall be worst case in terms of weight and stiffness.

The influence of connections, piping, cables, etc. shall be taken into account when mounting the specimen.

The normal "in service" mounting structure of the specimen should be included in the test.

NOTE 4: Single-axis excitation is recommended; simultaneous multi-axis excitation is also acceptable, but it is not recommended since, in general, multi-axis gives less reproducible test results.

NOTE 5: The three testing axes can be reduced to two horizontal axes if the equipment, after the vibration response investigation in the vertical axis, does not exhibit any resonance below 20 Hz.

NOTE 6: The strong part of the time-history should be at least 15 s.

NOTE 7: This value is the duration of each time-history signal.

NOTE 8: 1 time-history shall be applied along each axis.

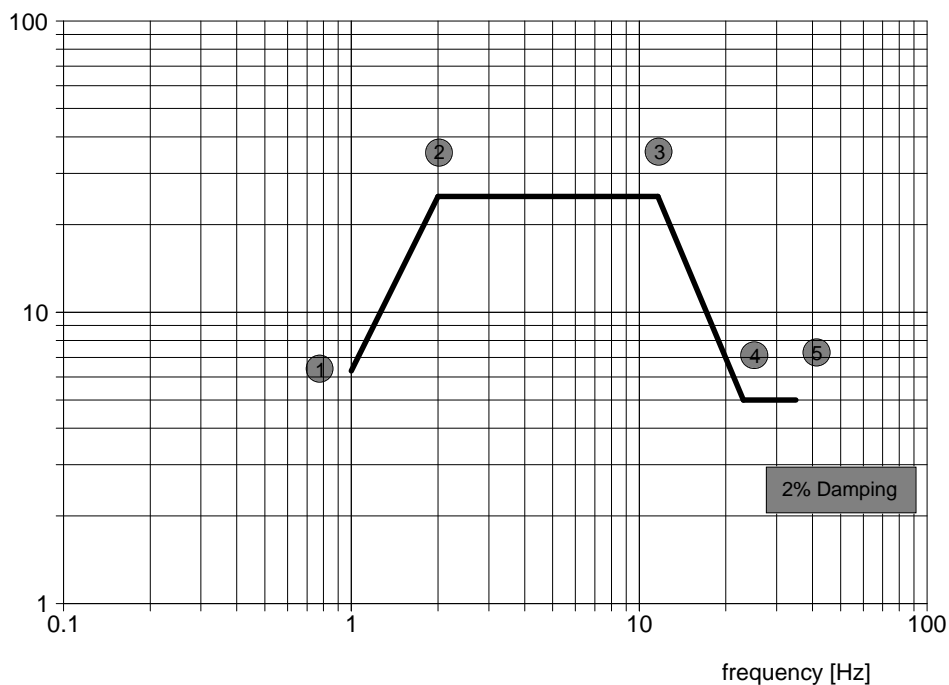


Figure 1: Earthquake Required Response Spectrum

Table 4: Acceleration co-ordinates for the Required Response Spectrum

Co-ordinate point	Frequency [Hz]	Ground acceleration [m/s ²]
1	1,0	6,3
2	2,0	25
3	11,6	25
4	23,0	5
5	35,0	5

Annex A (informative): Bibliography

- ETR 035: "Equipment Engineering (EE); Environmental engineering; Guidance and terminology".
- IEC 68-1: "Environmental testing part 1: General and guidance".

History

Document history	
July 1996	Public Enquiry PE 109: 1996-07-08 to 1996-11-01