ETS 300 019-2-3

AMENDMENT

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This draft amendment A2, if approved, will modify the European Telecommunication Standard ETS 300 019-2-3 (1994)

Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-3: Specification of environmental tests T 3.1 to T 3.5; Stationary use at weatherprotected location

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Foreword

This draft amendment two to ETS 300 019-2-3 (1994) has been produced by the Equipment and Engineering (EE) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the One step Approval Procedure phase of the ETSI standards approval procedure.

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

Amendments

Page 12, subclause 3.2

Replace table 3.2 with the following:

Environmental parameter			Environmental Class 3.2	Environmental test specification T 3.2: In-use, Partly temperature-controlled locations			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-5	-5	16 h	IEC 68-2-1	Ab/Ad: Cold (8) (9)
	high	(°C)	+45	+45 (2) (18) or +55	16 h	IEC 68-2-2	Bb/Bd: Dry heat (25)
	change	temp range (°C)		+25/+55 or +25/+45 (2) or +25/+40 (18)	half cycle t_1 = 3 h	IEC 68-2-14	Nb: Change of temperature (25)
		rate (°C/min)	0,5	0,5 (4) (7) (16)			
Humidity	relative	low (%)	5	none (5)			
		high (%) (°C)	95	93 +30	4 d	IEC 68-2-56	Cb: Damp heat steady state (25)
		condensation (°C) (%)	yes	+30° 90-100 (22) (19)	1 cycle	IEC 68-2-30	Db: Damp heat cyclic Variant 1 (25)
	absolute	low (g/m^3)	1	none (5) (10)			
		high (g/m^3)	29	(12)			
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		yes	(5)			
Radiation	solar	(W/m^2)	700	(21)			
	heat	(W/m^2)	600	(3)			

(continued)

Page 15, subclause 3.3

Replace table T 3.3 with the following:

Environmental parameter				Environmental Class 3.3	Environmental test specification T 3.3: In-use, Not temperature-controlled locations			
Type	Parameter	Detail parameter		Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low		(°C)	-25	-25	16 h	IEC 68-2-1	Ab/Ad: Cold (8) (9)
	high		(°C)	+55	+55 (2) or +70	16 h	IEC 68-2-2	Bb/Bd: Dry heat (26)
	change		(°C) (°C/min)	 0,5	-5/+45 (4) 0,5 (7) (16)	1 cycle t_1 = 3 h	IEC 68-2-14	Nb: Change of temperature (26)
Humidity	relative	low	(%)	10	none (5)			
		high	(%) (°C)	100	93 +30	4 d	IEC 68-2-56	Cb: Damp heat steady state (26)
		condensation	(%) (°C)	yes	90-100 +30 (22)	2 cycles	IEC 68-2-30	Db: Damp heat cyclic Variant 1 (26)
	absolute	low	(g/m^3)	0,5	none (5) (10)			
		high	(g/m^3)	29	(12)			
Air	pressure	low	(kPa)	70	none			
		high	(kPa)	106	none			
	speed		(m/s)	5,0	none			
Water	rain	intensity		wind driven	(20)			
		low temperature		no				
	other sources			dripping water	(20)			
	icing & frosting			yes	(5)			
Radiation	solar		(W/m^2)	1200	(21)			
	heat		(W/m^2)	600	(3)			

(continued)

Page 18, subclause 3.4

Replace table T 3.4 with the following:

Environmental parameter			Environmental Class 3.4	Environmental test specification T 3.4: In-use, Sites with heat trap.			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-40	-40	16 h	IEC 68-2-1	Ab/Ad: Cold (8) (9)
	high	(°C)	+70	+70 (2) or +85	16 h	IEC 68-2-2	Bb/Bd: Dry heat (27)
	change	(°C) (°C/min)	 0,5	-5/+45 0,5 (4) (7) (16)	2 cycles $t_1 = 3$ h	IEC 68-2-14	Nb: Change of temperature (27)
Humidity	relative	low (%)	10	none (5)			
		high (%) (°C)	100	93 +35 (16)	4 d	IEC 68-2-56	Cb: Damp heat steady state (27)
		condensation (%) (°C)	yes	 90-100 +30 (16)	 2 cycles	 IEC 68-2-30	 Db: Damp heat cyclic Variant 1 (27)
	absolute	low (g/m^3)	0,1	none (5) (10)			
		high (g/m^3)	35	(12)			
Air	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	5,0	none			
Water	rain	intensity	wind driven	(20)			
		low temperature	no				
	other sources		dripping and spraying water	(20)			
	icing & frosting		yes	(5)			
Radiation	solar	(W/m^2)	1200	(21)			
	heat	(W/m^2)	600	(3)			

(continued)

Page 18, subclause 3.5

Replace table T 3.5 with the following:

Environmental parameter			Environmental Class 3.5	Environmental test specification T 3.5: In-use, Sheltered locations.			
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method
Air temperature	low	(°C)	-40	-40	16 h	IEC 68-2-1	Ab/Ad: Cold (8) (9)
	high	(°C)	+40	+40	16 h	IEC 68-2-2	Bb/Bd: Dry heat (28)
	change	(°C) (°C/min)	 1,0	-40/+40 1,0 (4)	2 cycles t_1 = 3 h	IEC 68-2-14	Nb: Change of temperature (28)
Humidity	relative	low (%)	10	none (5)			
		high (%) (°C)	100	93 +35 (16)	4 d	IEC 68-2-56	Cb: Damp heat steady state (28)
		condensation (%) (°C)	yes	 90-100 +35 (16)	2 cycles	IEC 68-2-30	Db: Damp heat cyclic Variant 1 (28)
	absolute	low (g/m^3)	0,1	none (5) (10)			
		high (g/m^3)	35	(12)			
Air	pressure	low (kPa)	70	none			
		high (kPa)	106	none			
	speed	(m/s)	30	none			
Water	rain	intensity	wind driven	(20)			
		low temperature	no				
	other sources		dripping and spraying water	(20)			
	icing & frosting		yes	(5)			
Radiation	solar	(W/m^2)	no				
	heat	(W/m^2)	600	none			

(continued)

Page 24, subclause 3.6

Add notes 25 to 28.

NOTE 25: The alternative test method given in annex C may be used.

NOTE 26: The alternative test method given in annex D.

NOTE 27: The alternative test method given in annex E may be used.

NOTE 28: The alternative test method given in annex F may be used.

Page 26, annex B

Replace by the following:

Annex B (normative): Alternative climatic test method for class 3.1

B.1 Description

This test method is an alternative to IEC 68 [2] temperature and most humidity tests. It can also contain the cold start test given in this ETS 300 019-2-3. The test uses a sequence which scans the characteristic conditions of the climatogram which is constructed from test severities specified in ETS 300 019-2-3. It may be applied to all equipment being tested for climatic conformance with class 3.1 in ETS 300 019-1.

B.2 Objectives

To provide a standard test method for determining the functionality of an equipment when it is tested in a variable climatic environment consisting of a simultaneous change in combined values of temperature and humidity.

The climatogram test takes into account the boundary climatic conditions which can affect equipment throughout Europe up to an altitude of 3000 metres. The objective of the test is the evaluation of equipment resistibility performance and no attempt is made to assess its reliability. This is why repairs are authorized during tests, provided that failures observed do not systematically recur in the same climatic conditions.

B.3 Test apparatus

The test apparatus shall consist of a single test chamber that is able to reproduce the conditions described in this annex.

The dimensions of the chamber shall be in accordance with the criteria described in IEC 68-2-56 [2].

NOTE: When climatic stabilization is specified, the time required will vary depending on the thermal mass of the equipment under test, its heat dissipation and the relative size of the test chamber.

For naturally ventilated equipment it is important that the air flow in the test chamber is controlled (less than 1 m/s) near the equipment under test in order to prevent undue influence on its ventilation system. This will allow components inside the equipment to reach their working temperature in relation to the ambient conditions of the chamber.

The test chamber is required to control the rate of change of temperature to a maximum of 0,5°C per minute and the rate of change of relative humidity to a maximum of 10 % per hour with the equipment in its operational state.

B.4 Methodology

The traditional method used for climatic testing of equipment in order to demonstrate its resistibility is to use the IEC 68-2 [2] tests (i.e. cold, dry heat, change of temperature and steady state damp heat). The severities of the tests are chosen to simulate the effects of the extreme climatic conditions of the class.

This annex describes an alternative test method which uses a sequence test following the characteristic conditions of the climatogram figure B.1.

B.5 Pre-conditioning

Pre-conditioning is required for a minimum period of one hour after temperature stabilization within the equipment under the initial condition 23°C / 50 % R.H. (i.e. point S on the climatogram of figure B.1).

B.6 Testing

B.6.1 Equipment operation

The equipment under test shall be in its operational state throughout the tests.

Input and load conditions of the equipment shall be chosen to obtain full utilization of the equipment under test. The dissipation shall be maximized, except for the low temperature test, where it shall be minimized.

B.6.2 Equipment failures

If a failure occurs, the whole test cycle shall be started again, after the failure has been recorded and rectified.

Table B.1: Test severities for class 3.1

Protected from solar and heat radiation or equipment is ventilated						Exposed to solar and heat radiation and equipment is not ventilated					
Exceptional operating conditions (8)			Normal operating conditions			Exceptional operating conditions (8)			Normal operating conditions		
Point	Temp (°C)	RH (%)	Point	Temp (°C)	RH (%)	Point	Temp (°C)	RH (%)	Point	Temp (°C)	RH (%)
S	+ 23 (3)	50 (6)	S	+23 (3)	50 (6)	S	+ 23 (3)	50 (6)	S	+23 (3)	50 (6)
A_e	+ 45 (3)	37 (6)	A via S1	+ 40 (3)	47 (6)	A_e	+ 55 (3)	23 (6)	A via S1	+ 50 (3)	30 (6)
B_e	+ 45 (3)	5 (5)	B	+ 40 (3)	5 (5)	B_e	+ 55 (3)	5 (5)	B	+ 50 (3)	5 (5)
C	+ 23 (3)	5 (5)	C	+23 (3)	5 (5)	C	+ 23 (3)	5 (5)	C	+23 (3)	5 (5)-
D	+ 5 (2)	15 (5)	D	+5 (4)	15 (5)	D	+ 5 (2)	15 (5)	D	+5 (2)	15 (5)
E_e	- 5 (2), (7)	Any (1)	E	+ 5 (2), (7)	Any (1)	E_e	- 5 (2), (7)	Any (1)	E	+ 5 (2), (7)	Any (1)
F_e	+ 5 (2)	90 (6)	F	+ 5 (2)	85 (6)	F_e	+ 5 (2)	90 (6)	F	+ 5 (2)	85 (6)
G_e	+ 28 (3)	90 (4)	G	+ 29 (3)	85 (4)	G_e	+ 28 (3)	90 (4)	G	+ 29 (3)	85 (4)
A_n	+ 40 (3)	47 (6)	A-	+40 (3)	47 (6)	A	+ 50 (3)	30 (6)	A	+50 (3)	30 (6)
S	+ 23 (3)	50 (6)	S-	+23 (3)-	50 (6)-	S	+ 23 (3)	50 (6)	S	+23 (3)	50 (6)

NOTE 1: It is acceptable to perform tests without controlling the humidity when testing below 5°C (as detailed in IEC 68-2-1 test Ad).
NOTE 2: +/- 3°C according to IEC 68-2-1.
NOTE3: +/- 2°C according to IEC 68-2-2 and IEC 68-2-56.
+/- 3°C is acceptable for certain chamber sizes, as indicated in IEC 68-2-2.
NOTE 4: +/- 3% RH according to IEC 68-2-56.
NOTE 5: Low relative humidity to be +/- 5%
NOTE 6: +/- 3% RH.
NOTE 7: If the cold start test is required in the product specification, when arriving at the point E the equipment shall be switched off; after temperature stabilization is reached within the equipment, it shall be switched on and the test continued.
NOTE 8: Exceptional operating conditions relate to reduced performance requirements.

B.6.4 Scanning the climatogram

The sequence of scanning the climatogram is shown in figure B.1. Scanning begins at point S and ends at point S.

The various points of the climatogram correspond with test severities specified in table B.1.

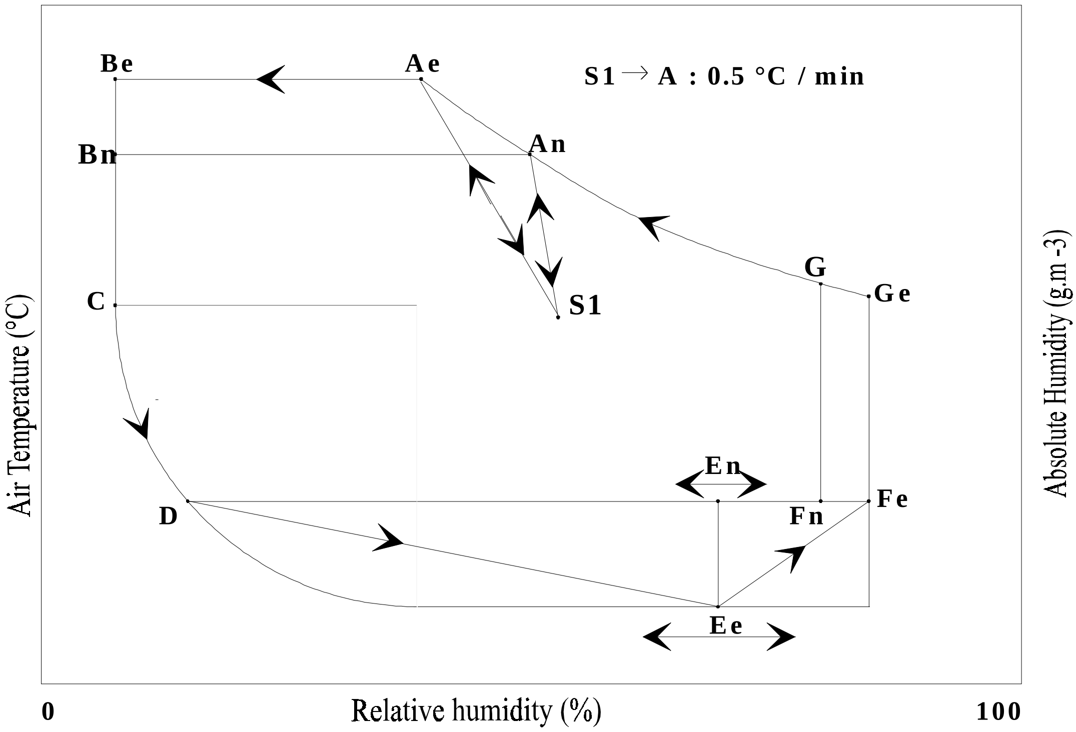

Figure B.1: Climatogram showing scanning sequence

B.6.5 Rates of change

The rates of change for temperature and humidity are:

a) 5° C/h during constant relative or absolute humidity;
b) 10% RH/h during constant temperature;
c) 0,5°C/min between point S to point A and A_e. This step is used to verify the performance of the equipment under maximum rate of change of temperature.

> NOTE: The cooling gradient may be reduced to 0,2°C/min where test chamber restrictions preclude a gradient of 0,5°C/min.

B.6.6 Functional requirements and verification

Where practicable, the performance of the equipment should be monitored throughout the test. The parameters shall be fully described in the relevant test specification.

At the beginning and the end of scanning (Point "S" on the test climatogram, figure B.1) the equipment shall be visually examined and functional checks shall be made as prescribed by the test specification.

Functional checks shall also be performed at relevant points on figure B.1 as described in subclauses B.6.3 and B.6.4, after a minimum period of one hour has elapsed since temperature stabilization within the equipment. The test specification shall detail which functions are to be checked at each point on the test climatogram.

Add annexes C, D, E, F

Annex C (normative): Alternative climatic test method for class 3.2

C.1 Description

This test method is an alternative to IEC 68 [2] temperature and most humidity tests. It can also contain the cold start test given in this ETS 300 019-2-3. The test uses a sequence which scans the characteristic conditions of the climatogram which is constructed from test severities specified in ETS 300 019-2-3. It may be applied to all equipment being tested for climatic conformance with class 3.2 in ETS 300 019-1.

NOTE: This test method is made complete with the condensation test (see table 4: Test specification T 3.2 - Test Db) and should be carried out on the same test specimen.

C.2 Objectives

To provide a standard test method for determining the functionality of an equipment when it is tested in a variable climatic environment consisting of a simultaneous change in combined values of temperature and humidity.

The climatogram test takes into account the boundary climatic conditions which can affect equipment throughout Europe up to an altitude of 3000 metres. The objective of the test is the evaluation of equipment resistibility performance and no attempt is made to assess its reliability. This is why repairs are authorized during tests, provided that failures observed do not systematically recur in the same climatic conditions.

C.3 Test apparatus

The test apparatus shall consist of a single test chamber that is able to reproduce the conditions described in this annex.

The dimensions of the chamber shall be in accordance with the criteria described in IEC 68-2-56 [2].

NOTE: When climatic stabilization is specified, the time required will vary depending on the thermal mass of the equipment under test, its heat dissipation and the relative size of the test chamber.

For naturally ventilated equipment it is important that the air flow in the test chamber is controlled (less than 1 m/s) near the equipment under test in order to prevent undue influence on its ventilation system. This will allow components inside the equipment to reach their working temperature in relation to the ambient conditions of the chamber.

The test chamber is required to control the rate of change of temperature to a maximum of 0,5°C per minute and the rate of change of relative humidity to a maximum of 10 % per hour with the equipment in its operational state.

C.4 Methodology

The traditional method used for climatic testing of equipment in order to demonstrate its resistibility is to use the IEC 68-2 [2] tests (i.e. cold, dry heat, change of temperature and steady state damp heat). The severities of the tests are chosen to simulate the effects of the extreme climatic conditions of the class.

This annex describes an alternative test method which uses a sequence test following the characteristic conditions of the climatogram figure C.1.

C.5 Pre-conditioning

Pre-conditioning is required for a minimum period of one hour after temperature stabilization within the equipment under the initial condition 23°C / 50 % R.H. (i.e. point S on the climatogram of figure C.1).

C.6 Testing

C.6.1 Equipment operation

The equipment under test shall be in its operational state throughout the tests.

Input and load conditions of the equipment shall be chosen to obtain full utilization of the equipment under test. The dissipation shall be maximized, except for the low temperature test, where it shall be minimized.

C.6.2 Equipment failures

If a failure occurs, the whole test cycle shall be started again, after the failure has been recorded and rectified.

C.6.3 Test severities

Table C.1: Test severities for class 3.2

Protected from solar and heat radiation or equipment is ventilated			Exposed to solar and heat radiation and equipment is not ventilated		
Climatic limits			Climatic limits		
Point	Temp (°C)	RH (%)	Point	Temp (°C)	RH (%)
S	+ 23 (3)	50 (6)	S	+ 23 (3)	50 (6)
A	+ 45 (3)	45 (6)	A	+ 55 (3)	28 (6)
B	+ 45 (3)	5 (5)	B	+ 55 (3)	5 (5)
C	+ 23 (3)	5 (5)	C	+ 23 (3)	5 (5)
D	+ 5 (2)	15 (5)	D	+ 5 (2)	15 (5)
E	- 5 (2), (7)	Any (1)	E	- 5 (2), (7)	Any (1)
F	+ 5 (2)	95 (6)	F	+ 5 (2)	95 (6)
G	+ 30 (3)	95 (4)	G	+ 30 (3)	95 (4)
A	+ 45 (3)	45 (6)	A	+ 55 (3)	45 (6)
S	+ 23 (3)	50 (6)	S	+ 23 (3)	50 (6)

NOTE 1: It is acceptable to perform tests without controlling the humidity when testing below 5°C (as detailed in IEC 68-2-1 test Ad).
NOTE 2: +/- 3°C according to IEC 68-2-1.
NOTE 3: +/- 2°C according to IEC 68-2-2 and IEC 68-2-56.
+/- 3°C is acceptable for certain chamber sizes, as indicated in IEC 68-2-2.
NOTE 4: +/-3% RH according to IEC 68-2-56.
NOTE 5: Low relative humidity to be +/- 5%.
NOTE 6: +/- 3% RH.
NOTE 7: If the cold start test is required in the product specification, when arriving at the point E the equipment shall be switched off; after temperature stabilization is reached within the equipment, it shall be switched on and the test continued.

C.6.4 Scanning the climatogram

The sequence of scanning the climatogram is shown in figure C.1. Scanning begins at point S and ends at point S.

The various points of the climatogram correspond with test severities specified in table C.1.

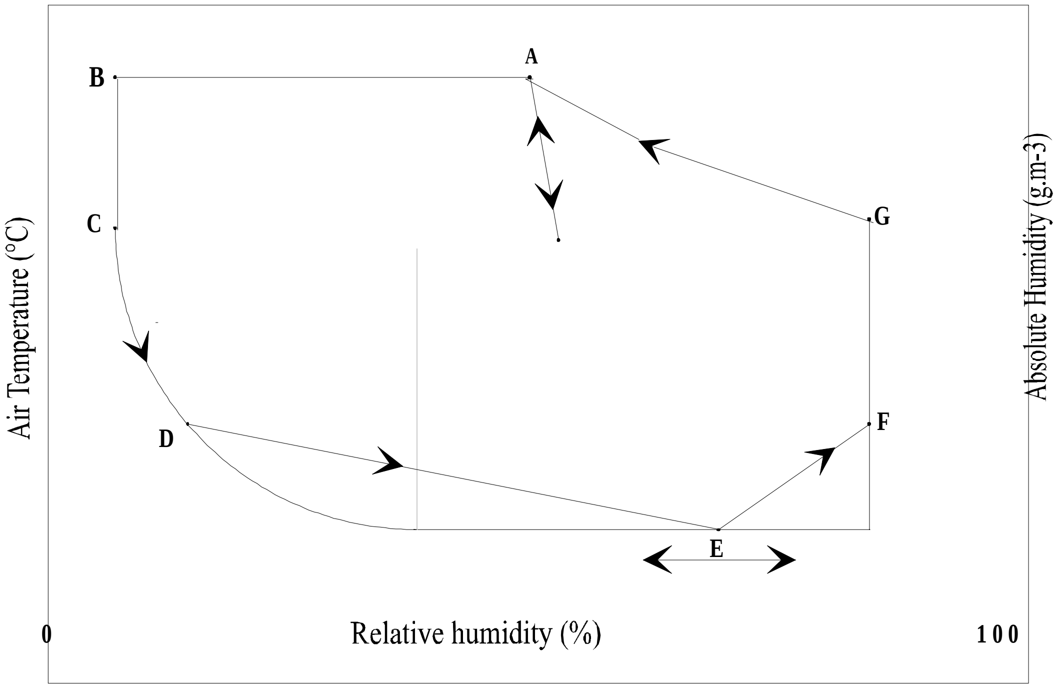

Figure C.1: Climatogram showing scanning sequence

C.6.5 Rates of change

The rates of change for temperature and humidity are:

a) 5°C/h during constant relative or absolute humidity;
b) 10% RH/h during constant temperature;
c) 0,5°C/min between point S to point A. This step is used to verify the performance of the equipment under maximum rate of change of temperature.

NOTE: The cooling gradient may be reduced to 0,2°C/min where test clamber restrictions preclude a gradient of 0,5°C/min.

C.6.6 Functional requirements and verification

Where practicable, the equipment's performance should be monitored throughout the test. The parameters shall be fully described in the relevant test specification.

At the beginning and the end of scanning (Point S on the test climatogram, figure C.1), the equipment shall be visually examined, and functional checks shall be made as prescribed by the test specification.

Functional checks shall also be performed at relevant points on figure C.1, as described in subclause C.6.4, after a minimum period of one hour has elapsed since temperature stabilization within the equipment. The test specification shall detail which functions are to be checked at each point on the test climatogram.

Annex D (normative): Alternative climatic test method for class 3.3

D.1 Description

This test method is an alternative to IEC 68 [2] temperature and most humidity tests. It can contain also the cold start test given in this ETS 300 019-2-3. The test uses a sequence which scans the characteristic conditions of the climatogram which is constructed from test severities specified in ETS 300 019-2-3. It may be applied to all equipment being tested for climatic conformance with class 3.3 in ETS 300 019-1.

NOTE: This test method is made complete with the condensation test (see table 6: Test specification T 3.3 - Test Db) and should be carried out on the same test specimen.

D.2 Objectives

To provide a standard test method for determining the functionality of an equipment when it is tested in a variable climatic environment consisting of a simultaneous change in combined values of temperature and humidity.

The climatogram test takes into account the boundary climatic conditions which can affect equipment throughout Europe up to an altitude of 3000 metres. The objective of the test is the evaluation of equipment resistibility performance and no attempt is made to assess its reliability. This is why repairs are authorized during tests, provided that failures observed do not systematically recur in the same climatic conditions.

D.3 Test apparatus

The test apparatus shall consist of a single test chamber that is able to reproduce the conditions described in this annex.

The dimensions of the chamber shall be in accordance with the criteria described in IEC 68-2-56 [2].

NOTE: When climatic stabilization is specified, the time required will vary depending on the thermal mass of the equipment under test, its heat dissipation and the relative size of the test chamber.

For naturally ventilated equipment it is important that the air flow in the test chamber is controlled (less than 1 m/s) near the equipment under test in order to prevent undue influence on its ventilation system. This will allow components inside the equipment to reach their working temperature in relation to the ambient conditions of the chamber.

The test chamber is required to control the rate of change of temperature to a maximum of 0,5°C per minute and the rate of change of relative humidity to a maximum of 10 % per hour with the equipment in its operational state.

D.4 Methodology

The traditional method used for climatic testing of equipment in order to demonstrate its resistibility is to use the IEC 68-2 [2] tests (i.e. cold, dry heat, change of temperature and steady state damp heat). The severities of the tests are chosen to simulate the effects of the extreme climatic conditions of the class.

This annex describes an alternative test method which uses a sequence test following the characteristic conditions of the climatogram figure D.1.

D.5 Pre-conditioning

Pre-conditioning is required for a minimum period of one hour after temperature stabilization within the equipment under the initial condition 23°C / 50 % R.H. (i.e. point S on the climatogram of figure D.1).

D.6 Testing

D.6.1 Equipment operation

The equipment under test shall be in its operational state throughout the tests.

Input and load conditions of the equipment shall be chosen to obtain full utilization of the equipment under test. The dissipation shall be maximized, except for the low temperature test, where it shall be minimized.

D.6.2 Equipment failures

If a failure occurs, the whole test cycle shall be started again, after the failure has been recorded and rectified.

D.6.3 Test severities

Table D.1: Test severities for class 3.3

Protected from solar and heat radiation or equipment is ventilated			Exposed to solar and heat radiation and equipment is not ventilated		
Climatic limits			Climatic limits		
Point	Temp (°C)	RH (%)	Point	Temp (°C)	RH (%)
S	+ 23 (3)	50 (6)	S	+ 23 (3)	50 (6)
A	+ 55 (3)	28 (6)	A	+ 70 (3)	15 (6)
B	+ 55 (3)	10 (5)	B	+ 70 (3)	10 (5)
C,D	+ 5 (2)	10 (5)	C,D	+ 5 (2)	10 (5)
E	- 25 (2), (7)	Any (1)	E	-25 (2), (7)	Any (1)
F	+ 5 (2)	100 (6)	F	+ 5 (2)	100 (6)
G	+ 29 (3)	100 (4)	G	+ 29 (3)	100 (4)
A	+ 55 (3)	28 (6)	A	+ 70 (3)	15 (6)
S	+ 23 (3)	50 (6)	S	+ 23 (3)	50 (6)

NOTE 1: It is acceptable to perform tests without controlling the humidity when testing below 5°C (as detailed in IEC 68-2-1 test Ad).
NOTE 2: +/- 3°C according to IEC 68-2-1.
NOTE 3: +/- 2°C according to IEC 68-2-2 and IEC 68-2-56.
+/- 3°C is acceptable for certain chamber sizes, as indicated in IEC 68-2-2.
NOTE 4 : +/- 3% RH according to IEC 68-2-56.
NOTE 5: Low relative humidity to be +/- 5%
NOTE 6: +/-3% RH.
NOTE 7: If the cold start test is required in the product specification, when arriving at the point E the equipment shall be switched off; after temperature stabilization is reached within the equipment, it shall be switched on and the test continued.

D.6.4 Scanning the climatogram

The sequence of scanning the climatogram is shown in figure D.1. Scanning begins at point S and ends at point S.

The various points of the climatogram correspond with test severities specified in table D.1.

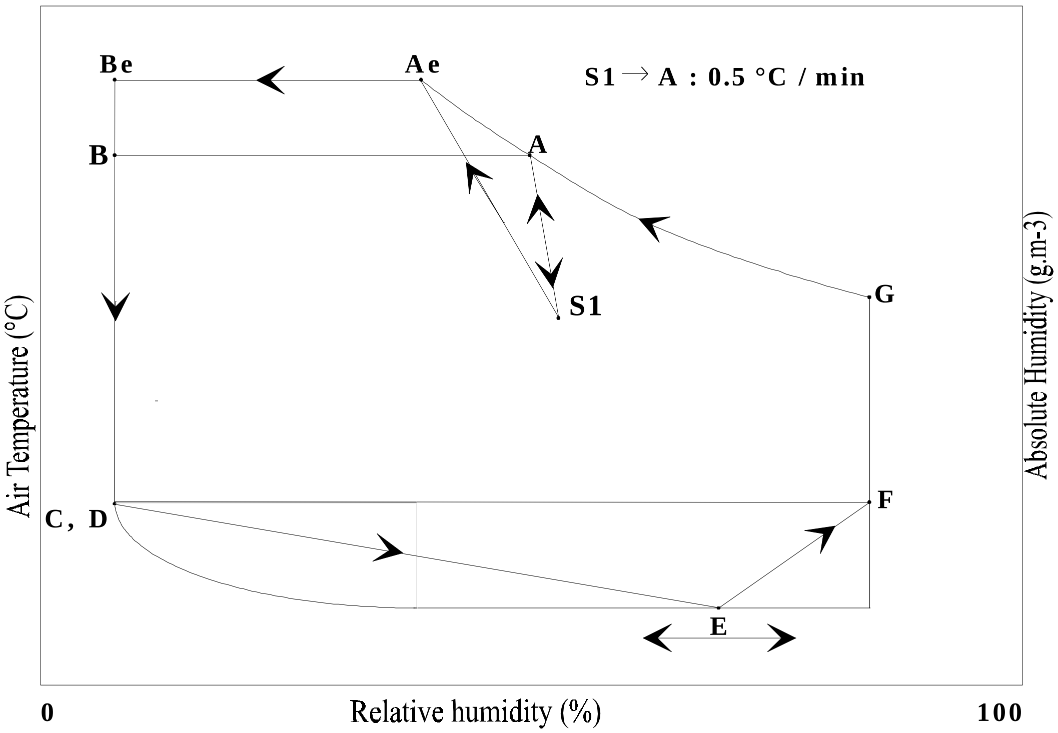

Figure D.1: Climatogram showing scanning sequence

D.6.5 Rates of change

The rates of change for temperature and humidity are:

a) 5°C/h during constant relative or absolute humidity;
b) 10% RH/h during constant temperature;
c) 0,5°C/min between point S to point A. This step is used to verify the performance of the equipment under maximum rate of change of temperature.

NOTE: The cooling gradient may be reduced to 0,2°C/min where test chamber restrictions preclude a gradient of 0,5°C/min.

D.6.6 Functional requirements and verification

Where practicable, the performance of the equipment should be monitored throughout the test. The parameters shall be fully described in the relevant test specification.

At the beginning and the end of scanning (Point S on the test climatogram, figure D.1), the equipment shall be visually examined, and functional checks shall be made as prescribed by the test specification.

Functional checks shall also be performed at relevant points on figure D.1, as described in subclause D.6.4, after a minimum period of one hour has elapsed since temperature stabilization within the equipment. The test specification shall detail which functions are to be checked at each point on the test climatogram.

Annex E (normative): Alternative climatic test method for class 3.4

E.1 Description

This test method is an alternative to IEC 68 [2] temperature and most humidity tests. It can also contain the cold start test given in this ETS 300 019-2-3. The test uses a sequence which scans the characteristic conditions of the climatogram which is constructed from test severities specified in ETS 300 019-2-3. It may be applied to all equipment being tested for climatic conformance with class 3.4 in ETS 300 019-1.

NOTE: This test method is made complete with the condensation test (see table 8 Test specification T 3.4 - Test Db) and should be carried out on the same test specimen.

E.2 Objectives

To provide a standard test method for determining the functionality of an equipment when it is tested in a variable climatic environment consisting of a simultaneous change in combined values of temperature and humidity.

The climatogram test takes into account the boundary climatic conditions which can affect equipment throughout Europe up to an altitude of 3000 metres. The objective of the test is the evaluation of equipment resistibility performance and no attempt is made to assess its reliability. This is why repairs are authorized during tests, provided that failures observed do not systematically recur in the same climatic conditions.

E.3 Test apparatus

The test apparatus shall consist of a single test chamber that is able to reproduce the conditions described in this annex.

The dimensions of the chamber shall be in accordance with the criteria described in IEC 68-2-56 [2].

NOTE: When climatic stabilization is specified, the time required will vary depending on the thermal mass of the equipment under test, its heat dissipation and the relative size of the test chamber.

For naturally ventilated equipment it is important that the air flow in the test chamber is controlled (less than 1m/s) near the equipment under test in order to prevent undue influence on its ventilation system. This will allow components inside the equipment to reach their working temperature in relation to the ambient conditions of the chamber.

The test chamber is required to control the rate of change of temperature to a maximum of 0,5°C per minute and the rate of change of relative humidity to a maximum of 10 % per hour with the equipment in its operational state.

E.4 Methodology

The traditional method used for climatic testing of equipment in order to demonstrate its resistibility is to use the IEC 68-2 [2] tests (i.e. cold, dry heat, change of temperature and steady state damp heat). The severities of the tests are chosen to simulate the effects of the extreme climatic conditions of the class.

This annex describes an alternative test method which uses a sequence test following the characteristic conditions of the climatogram figure E.1.

E.5 Pre-conditioning

Pre-conditioning is required for a minimum period of one hour after temperature stabilization within the equipment under the initial condition 23°C / 50 % R.H. (i.e. point S on the climatogram of figure E.1).

E.6 Testing

E.6.1 Equipment operation

The equipment under test shall be in its operational state throughout the tests.

Input and load conditions of the equipment shall be chosen to obtain full utilization of the equipment under test. The dissipation shall be maximized, except for the low temperature test, where it shall be minimized.

E.6.2 Equipment failures

If a failure occurs, the whole test cycle shall be started again, after the failure has been recorded and rectified.

E.6.3 Test severities

Table E.1: Test severities for class 3.4

Protected from solar and heat radiation or equipment is ventilated		
Climatic limits		
Point	Temp (°C)	RH (%)
S	+ 23 (3)	50 (6)
A	+ 70 (3)	18 (6)
B	+ 70 (3)	10 (5)
C,D	+ 5 (2)	10 (5)
E	- 40 (2), (7)	Any (1)
F	+ 5 (2)	100 (6)
G	+ 33 (3)	100 (4)
A	+ 70 (3)	28 (6)
S	+ 23 (3)	50 (6)

NOTE 1: It is acceptable to perform tests without controlling the humidity when testing below 5°C (as detailed in IEC 68-2-1 test Ad).
NOTE 2: +/- 3°C according to IEC 68-2-1.
NOTE 3: +/- 2°C according to IEC 68-2-2 and IEC 68-2-56.
+/- 3°C is acceptable for certain chamber sizes, as indicated in IEC 68-2-2.
NOTE 4: +/- 3% RH according to IEC 68-2-56.
NOTE 5: Low relative humidity to be +/- 5%.
NOTE 6: +/- 3% RH.
NOTE 7: If the cold start test is required in the product specification, when arriving at the point E the equipment shall be switched off; after temperature stabilization is reached within the equipment, it shall be switched on and the test continued.

E.6.4 Scanning the climatogram

The sequence of scanning the climatogram is shown in figure E.1. Scanning begins at point S and ends at point S.

The various points of the climatogram correspond with test severities specified in table E.1.

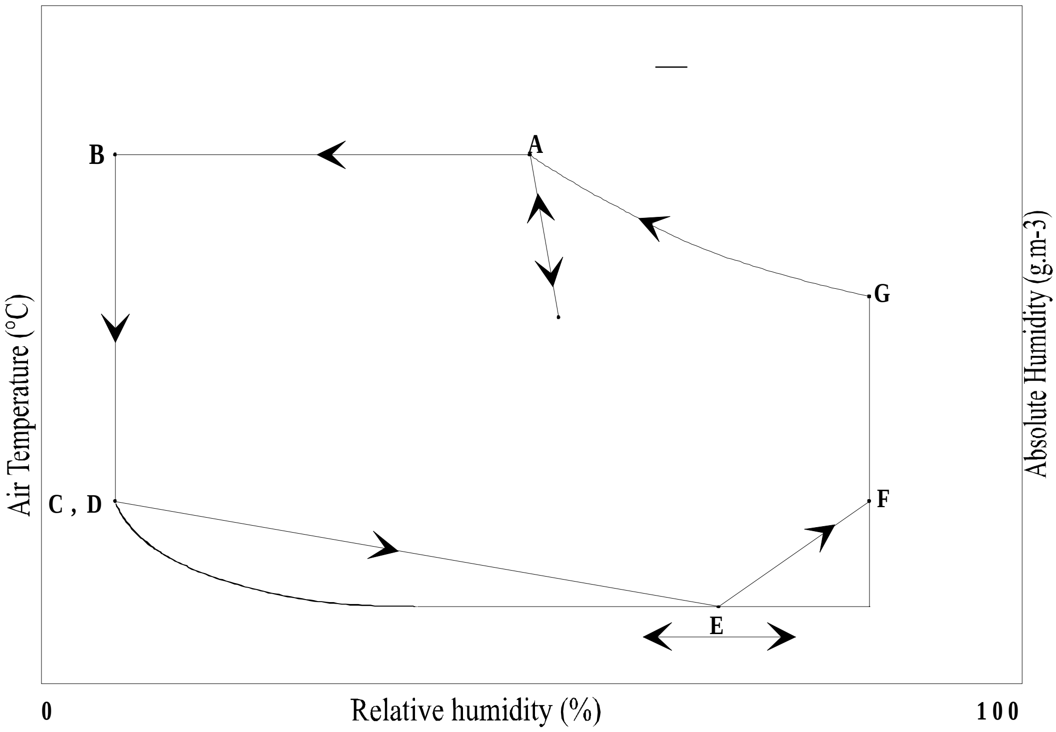

Figure E.1: Climatogram showing scanning sequence

E.6.5 Rates of change

The rates of change for temperature and humidity are:

a) 5° C/h during constant relative or absolute humidity;
b) 10% RH/h during constant temperature;
c) 0,5°C/min between point S_1 to point A. This step is used to verify the performance of the equipment under maximum rate of change of temperature.

NOTE: The cooling gradient may be reduced to 0,2°C/min where test chamber restrictions preclude a gradient of 0,5°C/min.

E.6.6 Functional requirements and verification

Where practicable, the performance of the equipment should be monitored throughout the test. The parameters shall be fully described in the relevant test specification.

At the beginning and the end of scanning (Point S on the test climatogram, figure E.1), the equipment shall be visually examined, and functional checks shall be made as prescribed by the test program.

Functional checks shall also be performed at relevant points on figure E.1, as described in subclause E.6.4, after a minimum period of one hour has elapsed since temperature stabilization within the equipment. The test specification shall detail which functions are to be checked at each point on the test climatogram.

Annex F (normative): Alternative climatic test method for class 3.5

F.1 Description

This test method is an alternative to IEC 68 [2] temperature and most humidity tests. It can also contain the cold start test, given in this ETS 300 019-2-3. The test uses a sequence test which scans the characteristic conditions of the climatogram which is constructed from test severities specified in ETS 300 019-2-3. It may be applied to all equipment being tested for climatic conformance with class 3.5 in ETS 300 019-1.

NOTE: This test method is made complete with the condensation test (see table 10 Test specification T 3.5) and should be carried out on the same test specimen..

F.2 Objectives

To provide a standard test method for determining the functionality of an equipment when it is tested in a variable climatic environment consisting of a simultaneous change in combined values of temperature and humidity.

The climatogram test takes into account the boundary climatic conditions which can affect equipment throughout Europe up to an altitude of 3000 metres. The objective of the test is the evaluation of equipment resistibility performance and no attempt is made to assess its reliability. This is why repairs are authorized during tests, provided that failures observed do not systematically recur in the same climatic conditions.

F.3 Test apparatus

The test apparatus shall consist of a single test chamber that is able to reproduce the conditions described in this annex.

The dimensions of the chamber shall be in accordance with the criteria described in IEC 68-2-56 [2].

NOTE: When climatic stabilization is specified, the time required will vary depending on the thermal mass of the equipment under test, its heat dissipation and the relative size of the test chamber.

For naturally ventilated equipment it is important that the air flow in the test chamber is controlled (less than 1 m/s) near the equipment under test in order to prevent undue influence on its ventilation system. This will allow components inside the equipment to reach their working temperature in relation to the ambient conditions of the chamber.

The test chamber is required to control the rate of change of temperature to a maximum of 0,5°C per minute and the rate of change of relative humidity to a maximum of 10 % per hour with the equipment in its operational state.

F.4 Methodology

The traditional method used for climatic testing of equipment in order to demonstrate its resistibility is to use the IEC 68-2 [2] tests (i.e. cold, dry heat, change of temperature and steady state damp heat). The severities of the tests are chosen to simulate the effects of the extreme climatic conditions of the class.

This annex describes an alternative test method which uses a sequence test following the characteristic conditions of the climatogram figure F.1.

F.5 Pre-conditioning

Pre-conditioning is required for a minimum period of one hour after temperature stabilization within the equipment under the initial condition 23°C / 50 % R.H. (i.e. point S on the climatogram of figure F.1).

F.6 Testing

F.6.1 Equipment operation

The equipment under test shall be in its operational state throughout the tests.

Input and load conditions of the equipment shall be chosen to obtain full utilization of the equipment under test. The dissipation shall be maximized, except for the low temperature test, where it shall be minimized.

F.6.2 Equipment failures

If a failure occurs, the whole test cycle shall be started again, after the failure has been recorded and rectified.

F.6.3 Test severities

Table F.1: Test severities for class 3.5

Protected from solar and heat radiation or equipment is ventilated		
Climatic limits		
Point	Temp (°C)	RH (%)
S	+ 23 (3)	50 (6)
A	+ 40 (3)	69 (6)
B	+ 40 (3)	10 (5)
C,D	+ 5 (2)	10 (5)
E	- 40 (2), (7)	Any (1)
F	+ 5 (2)	100 (6)
G	+ 33 (3)	100 (4)
A	+ 40 (3)	69 (6)
S	+ 23 (3)	50 (6)

NOTE 1: It is acceptable to perform tests without controlling the humidity when testing below 5°C (as detailed in IEC 68-2-1 test Ad).
NOTE 2: +/- 3°C according to IEC 68-2-1.
NOTE 3: +/-2°C according to IEC 68-2-2 and IEC 68-2-56. +/-3°C is acceptable for certain chamber sizes, as indicated in IEC 68-2-2.
NOTE 4: +/- 3% RH according to IEC 68-2-56.
NOTE 5: Low relative humidity to be +/- 5%.
NOTE 6: +/- 3% RH.
NOTE 7: If the cold start test is required in the product specification, when arriving at the point E the equipment shall be switched off; after temperature stabilization is reached within the equipment, it shall be switched on and the test continued.

F.6.4 Scanning the climatogram

The sequence of scanning the climatogram is shown in figure F.1. Scanning begins at point S and ends at point S.

The various points of the climatogram correspond with test severities specified in table F.1.

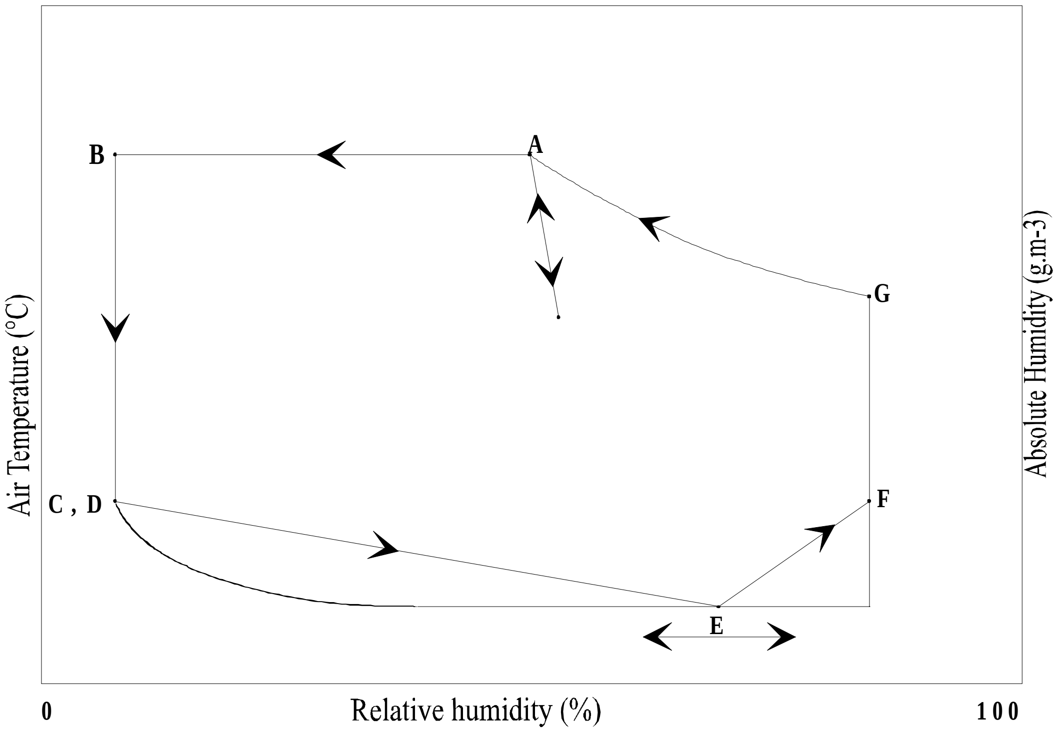

Figure F.1: Climatogram showing scanning sequence

F.6.5 Rates of change

The rates of change for temperature and humidity are:

a) 5°C/h during constant relative or absolute humidity;
b) 10% RH/h during constant temperature;
c) 1°C/min between point S to point A. This step is used to verify the performance of the equipment performance under maximum rate of change of temperature.

F.6.6 Functional requirements and verification

Where practicable, the performance of the equipment should be monitored throughout the test. The parameters shall be fully described in the relevant test specification.

At the beginning and the end of scanning (Point S on the test climatogram, figure F.1), the equipment shall be visually examined and functional checks shall be made as prescribed by the test specification.

Functional checks shall also be performed at relevant points on figure F.1, as described in subclause F.6.4, after a minimum period of one hour has elapsed since temperature stabilization within the equipment. The test specification shall detail which functions are to be checked at each point on the test climatogram.

History

Document history		
May 1994	First Edition	
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December 1997	One-step Approval Procedure	OAP 9817: 1997-12-26 to 1998-04-24