



**Environmental Engineering (EE);
Environmental conditions and environmental tests
for telecommunications equipment;
Part 2: Specification of environmental tests;
Sub-part 3: Stationary use at weatherprotected locations**

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Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Environmental Engineering (EE), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI EN Approval Procedure (ENAP).

The present document is part 2, sub part 3 of a multi-part deliverable covering the classification of environmental conditions and environmental tests for telecommunications equipment, as identified below:

Part 1: "Classification of environmental conditions"; (see note 1)

Part 2: "Specification of environmental tests": (see note 2)

Sub-part 0: "Introduction";

Sub-part 1: "Storage";

Sub-part 2: "Transportation";

Sub-part 3: "Stationary use at weatherprotected locations";

Sub-part 4: "Stationary use at non-weatherprotected locations";

Sub-part 5: "Ground vehicle installations";

Sub-part 6: "Ship environments";

Sub-part 7: "Portable and non-stationary use";

Sub-part 8: "Stationary use at underground locations".

NOTE 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.

NOTE 2: Specifies the recommended test severities and test methods for the different environmental classes.

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

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document specifies test severities and methods for the verification of the required resistibility of equipment according to the relevant environmental class.

The tests in the present document apply to stationary use of equipment at weatherprotected locations covering the environmental conditions stated in ETSI EN 300 019-1-3 [1].

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found in the [ETSI docbox](#).

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The following referenced documents are necessary for the application of the present document.

- [1] [ETSI EN 300 019-1-3 \(V3.1.1\) \(2026\)](#): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1: Classification of environmental conditions; Sub-part 3: Stationary use at weatherprotected locations".
- [2] [IEC 60068-2-1:2025](#): "Environmental testing - Part 2-1: Tests - Test A: Cold".
- [3] Void.
- [4] [IEC 60721-3-3:2019](#): "Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weatherprotected locations".
- [5] [IEC 60068-2-6:2007](#): "Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)".
- [6] [IEC 60068-2-2:2025](#): "Environmental testing - Part 2-2: Tests - Test B: Dry heat".
- [7] [IEC 60068-2-14:2023](#): "Environmental testing - Part 2-14: Tests - Test N: Change of temperature".
- [8] [IEC 60068-2-78:2025](#): "Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state".
- [9] [IEC 60068-2-30:2025](#): "Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)".
- [10] [IEC 60068-2-64:2008+AMD1:2019](#): "Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance".
- [11] Void.
- [12] [IEC 60068-2-57:2013](#): "Environmental testing - Part 2-57: Tests - Test Ff: Vibration - Time-history and sine-beat method".
- [13] [IEC 60068-2-68:1994](#): "Environmental testing - Part 2-68: Tests - Test L: Dust and sand".
- [14] [IEC 60068-2-13:2021](#): "Environmental testing - Part 2-13: Tests - Test M: Low air pressure".
- [15] [IEC 60068-2-18:2017](#): "Environmental testing - part 2-18: Tests - Test R and guidance: Water".

- [16] [ISO 9223:2012](#): "Corrosion of metals and alloys — Corrosivity of atmospheres — Classification, determination and estimation".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

- [i.1] ETSI EN 300 019-1-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-0: Classification of environmental conditions; Introduction".
- [i.2] ETSI EN 300 019-2-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2: Specification of environmental tests; Sub-part 0: Introduction".
- [i.3] ISO 9226:2012: "Corrosion of metals and alloys — Corrosivity of atmospheres — Determination of corrosion rate of standard specimens for the evaluation of corrosivity".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 300 019-1-0 [i.1] apply.

3.2 Symbols

Void.

3.3 Abbreviations

Void.

4 Environmental test specifications

4.0 General

The equipment shall be tested in its operational state throughout the test conditions described in the present document. The detailed descriptions of the environmental conditions are given in clauses 4 and 5 of ETSI EN 300 019-1-3 [1].

ETSI EN 300 019-2-0 [i.2] forms a general overview of part 2 of this multi-part deliverable.

4.1 Equipment setup and configuration

The equipment shall be tested in its operational state throughout the test conditions described in the present document unless otherwise stated. Input and load conditions of the equipment shall be chosen to obtain full utilization of the equipment under test. The heat dissipation shall be maximized, except for the steady state, low temperature test, where it shall be minimized.

4.2 Performance criteria

The following performance criteria shall apply in tests defined by the present document.

Performance criterion A:

The equipment shall function according to the manufacturer specifications before, during and after the tests. No degradation of performance or loss of function is allowed below the performance level specified by the manufacturer when the equipment is used as intended. If the minimum performance level is not specified by the manufacturer, then this may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion B:

The equipment shall function according to the manufacturer specifications before and after the tests. During the test it is not required to monitor the equipment functionality. No degradation of performance or loss of function is allowed below the performance level specified by the manufacturer when the equipment is used as intended. If the minimum performance level is not specified by the manufacturer, then this may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Performance criterion C:

The equipment shall function according to the manufacturer specifications before and after the tests. No degradation of performance or loss of function is allowed below the performance level specified by the manufacturer when the equipment is used as intended. If the minimum performance level is not specified by the manufacturer, then this may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended. During the application of the test, temporary loss of function is allowed but after the test the equipment shall restore to the normal functionality without replacement of components, manual rebooting or human intervention. The equipment shall sustain the test without permanent structural or mechanical damage.

Performance criterion D:

This performance criterion applies to the enclosure of the equipment. No corrosion traces (e.g. rust) or deterioration of the enclosure shall occur at the end of the test.

4.3 Specifications T 3.10 and T 3.10E: Temperature-controlled enclosed locations having no humidity control

Specification T 3.10: Temperature-controlled enclosed locations having no humidity control - normal operating conditions.

The specification in table 1, table 2 and table 3 shall apply to temperature-controlled enclosed locations where humidity is usually not controlled.

Table 1: Test specification T 3.10: Temperature-controlled enclosed locations - climatic tests

Environmental parameter			Environmental Class 3.10		Environmental test specification T 3.10: In-use, Temperature-controlled enclosed locations				
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Air temperature	Low	(°C)	+5	+5	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1
	High	(°C)	+40	+40 or +50	16 h	IEC 60068-2-2 [6]	Bb/Bd/Be: Dry heat	A	2
	Change	(°C) (°C/min)	0,5	+5 to +40 0,5	2 cycles t ₁ = 3 h	IEC 60068-2-14 [7]	Nb: Change of temperature	A	3
Humidity	Relative	low (%)	5	None					4
		high (%)	85	85	4 d	IEC 60068-2-78 [8]	Cab: Damp heat steady state	A	5
		condensation (°C)	No	None					
	Absolute	low (g/m ²)	1	None					4
		high (g/m ²)	25	None					7
Air	Pressure	low (kPa)	70	70	2 h	IEC 60068-2-13 [14]	Test M: Low air pressure	A	8
		high (kPa)	106	None					8
	Speed	(m/s)	1,0	None					4
Water	Rain	Intensity	No	None					
		low temperature	No	None					
	Other sources		No	None					
	Icing & frosting		No	None					
Radiation	Solar	(W/m ²)	700	None					9
	Heat	(W/m ²)	600	None					10

Environmental parameter			Environmental Class 3.10		Environmental test specification T 3.10: In-use, Temperature-controlled enclosed locations				
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Chemically active substances	Sulphur	SO ₂ (mg/m ³)	[16]	None					11
		H ₂ S (mg/m ³)	[16]	None					11
	Chlorine	salt mist	[16]	None					11
		Cl (mg/m ³)	[16]	None					11
		HCl (mg/m ³)	[16]	None					11
	Nitrogen	NO _x (mg/m ³)	[16]	None					11
		NH ₃ (mg/m ³)	[16]	None					11
	Hydrogen fluoride HF	(mg/m ³)	[16]	None					11
	Ozone O ₃	(mg/m ³)	[16]	None					11
Mechanically active substances	Dust	sedimentation (mg/(m ² d))	6						12
		suspension (mg/m ³)	no	None					
	Sand	(mg/m ³)	no	None					
Flora and fauna	Micro organisms		negligible						
	Rodents, insects		negligible						

Environmental parameter			Environmental Class 3.10		Environmental test specification T 3.10: In-use, Temperature-controlled enclosed locations				
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
NOTE 1:	(Air temperature, low). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If a cold start up test is performed, the characteristic severity should be used as a cold start up temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the cold start up test shall commence once low temperature stability is achieved.								
NOTE 2:	(Air temperature, high). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If two test temperatures are given, the lower test temperature applies if the equipment is protected against solar and heat radiation or the equipment is ventilated (natural or forced). The higher test temperature includes the heating effects of solar and/or heat radiation. If a high temperature start up test is performed, the characteristic severity should be used as a high start up temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the high temperature start up test shall commence once high temperature stability is achieved.								
NOTE 3:	(Air temperature, change). The change of temperature test is normally used to check design tolerance. IEC 60068-2-14 [7] Test Nb shall be used. For change of temperature of 0,5 °C/min, the cooling gradient may be reduced to 0,2 °C/min where test chamber restrictions preclude a gradient of 0,5 °C/min.								
NOTE 4:	(Relative humidity, low). There is no IEC 60068-2 series test method for this parameter.								
NOTE 5:	(Humidity, relative, high). IEC 60068-2-78 [8] Test Cab shall be used with test values not higher than climatogram limits for this class.								
NOTE 6:	Void.								
NOTE 7:	(Humidity, absolute, high). This effect is considered to be partly included in the damp heat test IEC 60068-2-78 [8] Test Cab.								
NOTE 8:	(Air pressure, low and high). No test is recommended for normal applications, because the effect of air pressure is evaluated at the component level. For sealed products or for products containing liquids, test M is recommended.								
NOTE 9:	(Radiation, solar). The higher test temperature as described in note 2 includes the heating effect of solar radiation. Photochemical tests can be made separately for components and materials.								
NOTE 10:	(Radiation, heat). The higher test temperature as described in note 2 includes the heating effect.								
NOTE 11:	(Chemically active substances). The characteristic severities are given in ISO 9223 [16]. For the chemically active substances, no specific tests are defined but they should be considered in the design phase. The following references provide guidance for the design: - ISO 9223:2012 [16]: this can be used to calculate the corrosion losses of standard metals. - ISO 9226:2012 [i.3]: this can be used to determine corrosion losses of standard specimens.								
NOTE 12:	(Mechanically active substances). The characteristic severities are much lower than lowest test severity in IEC 60068-2-68 [13] Test L and therefore no test is recommended. This condition should be considered when designing the equipment and when choosing components and materials.								

Table 2: Test specification T 3.10: Temperature-controlled enclosed locations having no humidity control - mechanical tests

Environmental parameter			Environmental Class 3.10	Environmental test specification T 3.10: In-use, Temperature-controlled enclosed locations					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Vibration	Random	acceleration spectral density ((m/s ²) ² /Hz)	0,01	0,01 (m/s ²) ² /Hz	30 minutes in each direction	IEC 60068-2-64 [10]	Test Fh: Vibration, broadband random	A	See note
		Frequency (Hz)	5 to 200						
Shocks	Shocks	acceleration (m/s ²)	No						
NOTE: (Vibration, random). The test severity values are not specified in IEC 60068-2 series. The maximum test frequency has been reduced to 100 Hz, because between 100 Hz and 200 Hz the contribution is insignificant. Also at low and high frequency ends the ASD is reduced by 12 dB/octave.									
				Classes: 3.11/3.12					
Acceleration RMS (for information only)				1,06 m/s ²					
Equipment under test shall be mounted in the "in-use" position. The equipment function shall be monitored throughout the test.									

Specification T 3.10E: Temperature-controlled enclosed locations having no humidity control - exceptional operating conditions.

The specification in table 3 shall apply to temperature-controlled enclosed locations where humidity is usually not controlled. The reference class is the same as for T 3.10, but with extended temperature and humidity ranges.

Table 3: Test specification T 3.10E: Temperature-controlled enclosed locations, exceptional operating conditions - climatic tests

Environmental parameter			Environmental Condition 3.10E	Environmental test specification T 3.10E: In-use, Temperature-controlled enclosed locations - Exceptional					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Air temperature	Low	(°C)	-5	-5	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1
	High	(°C)	+45	+45 or +55	16 h	IEC 60068-2-2 [6]	Bb/Bd/Be: Dry heat	A	2
	Change	(°C) (°C/min)	0,5	+25 to+45 0,5	two cycles $t_1 = 3$ h	IEC 60068-2-14 [7]	Nb: Change of temperature	A	3
Humidity	Relative	low (%)	5	none					4
		high (%)	90	93	4 d	IEC 60068-2-78 [8]	Cab: Damp heat steady state	A	5
		condensation (°C)	no						
	Absolute	low (g/m ³)	1	none					4
		high (g/m ³)	25						6
Radiation	Solar	(W/m ²)	700						7
	Heat	(W/m ²)	600						8

Environmental parameter			Environmental Condition 3.10E	Environmental test specification T 3.10E: In-use, Temperature-controlled enclosed locations - Exceptional					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
NOTE 1: (Air temperature, low). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If a cold start up test is performed, the characteristic severity should be used as a cold start up temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the cold start up test shall commence once low temperature stability is achieved. NOTE 2: (Air temperature, high). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If two test temperatures are given, the lower test temperature applies if the equipment is protected against solar and heat radiation or the equipment is ventilated (natural or forced). The higher test temperature includes the heating effects of solar and/or heat radiation. If a high temperature start-up test is performed, the characteristic severity should be used as a high start up temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the high temperature start-up test shall commence once high temperature stability is achieved. NOTE 3: (Air temperature, change). The change of temperature test is normally used to check design tolerance. IEC 60068-2-14 [7] Test Nb shall be used. For change of temperature of 0,5 °C/min, the cooling gradient may be reduced to 0,2 °C/min where test chamber restrictions preclude a gradient of 0,5 °C/min. NOTE 4: (Relative humidity, low). There is no IEC 60068-2 series test method for this parameter. NOTE 5: (Humidity, relative, high). IEC 60068-2-78 [8] Test Cab shall be used with test values not higher than climatogram limits for this class. NOTE 6: (Humidity, absolute, high). This effect is considered to be partly included in the damp heat test IEC 60068-2-78 [8] Test Cab. NOTE 7: (Radiation, solar). The higher test temperature as described in note 2 includes the heating effect of solar radiation. Photochemical tests can be made separately for components and materials. NOTE 8: (Radiation, heat). The higher test temperature as described in note 2 includes the heating effect.									

4.4 Specification T 3.11: Enclosed locations having no temperature or humidity control

The specification in table 4 and table 5 shall apply to weather-protected locations having no temperature or humidity control (i.e. one or the other is not controlled), but where heating may be used to avoid low temperatures. The building construction avoids extremely high temperatures.

Table 4: Test specification T 3.11: Enclosed locations having no temperature or humidity control- climatic tests

Environmental parameter			Environmental Class 3.11	Environmental test specification T 3.11: In-use, Enclosed locations having no temperature or humidity control					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Air temperature	Low	(°C)	-5	-5	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1
	High	(°C)	+55	+55	16 h	IEC 60068-2-2 [6]	Bb/Bd/Be: Dry heat	A	2
	Change	(°C) (°C/min)	0,5	-5 to +25 or -5 to +55 0,5	two cycles $t_1 = 3$ h	IEC 60068-2-14 [7]	Nb: Change of temperature	A	3
Humidity	Relative	low (%)	10	none					4
		high (%)	100	93	4 d steady state	IEC 60068-2-78 [8]	Cab: Damp heat	A	5
		condensation (°C) (%)	yes	+30° 90 - 100	2 cycles	IEC 60068-2-30 [9]	Db: Damp heat cyclic Variant 2	A	6
	Absolute	low (g/m ³)	0,5	none					4
		high (g/m ³)	29						7
Air	Pressure	low (kPa)	70	70	2 h	IEC 60068-2-13 [14]	Test M: Low air pressure	A	8
		high (kPa)	106	none					8
	Speed	(m/s)	1,0	none					4
Water	Rain	intensity	No						
		low temperature	No						
	Other sources		dripping water						15
	Icing & frosting		Yes						4
Radiation	Solar	(W/m ²)	700						9
	Heat	(W/m ²)	600						10

Environmental parameter			Environmental Class 3.11	Environmental test specification T 3.11: In-use, Enclosed locations having no temperature or humidity control					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Chemically active substances	Sulphur	SO ₂ (mg/m ³)	[16]	none					11
		H ₂ S (mg/m ³)	[16]	none					11
	Chlorine	salt mist	[16]	none					11
		Cl (mg/m ³)	[16]	none					11
		HCl (mg/m ³)	[16]	none					11
	Nitrogen	NO _x (mg/m ³)	[16]	none					11
		NH ₃ (mg/m ³)	[16]	none					11
	Hydrogen fluoride HF	(mg/m ³)	[16]	none					11
	Ozone O ₃	(mg/m ³)	[16]	none					11
Mechanically active substances	Dust	sedimentation (mg/(m ² d))	No	none					
		suspension (mg/m ² h)	600	none					13
	Sand	(mg/m ³)	No	none					
Flora and fauna	Micro organisms		mould, fungus, etc.	none					14
	Rodents, insects		rodents, etc.	none					14
NOTE 1: (Air temperature, low). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If a cold start up test is performed, the characteristic severity should be used as a cold start up temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the cold start up test shall commence once low temperature stability is achieved.									
NOTE 2: (Air temperature, high). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If two test temperatures are given, the lower test temperature applies if the equipment is protected against solar and heat radiation or the equipment is ventilated (natural or forced). The higher test temperature includes the heating effects of solar and/or heat radiation. If a high temperature start-up test is performed, the characteristic severity should be used as a high start up temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the high temperature start-up test shall commence once high temperature stability is achieved.									
NOTE 3: (Air temperature, change). The change of temperature test is normally used to check design tolerance. IEC 60068-2-14 [7] Test Nb shall be used. For change of temperature of 0,5 °C/min, the cooling gradient may be reduced to 0,2 °C/min where test chamber restrictions preclude a gradient of 0,5 °C/min.									
NOTE 4: (Relative humidity, low). There is no IEC 60068-2 series test method for this parameter.									
NOTE 5: (Humidity, relative, high). IEC 60068-2-78 [8] Test Cab shall be used with test values not higher than climatogram limits for this class.									
NOTE 6: (Condensation). IEC 60068-2-30 [9] Test Db shall be used with test values not higher than climatogram limits for this class.									
NOTE 7: (Humidity, absolute, high). This effect is considered to be partly included in the damp heat test IEC 60068-2-78 [8] Test Cab.									

Environmental parameter			Environmental Class 3.11	Environmental test specification T 3.11: In-use, Enclosed locations having no temperature or humidity control					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
NOTE 8:	(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 9:	(Radiation, solar). The higher test temperature as described in note 2 includes the heating effect of solar radiation. Photochemical tests can be made separately for components and materials.								
NOTE 10:	(Radiation, heat). The higher test temperature as described in note 2 includes the heating effect.								
NOTE 11:	(Chemically active substances). The characteristic severities are given in ISO 9223:2012 [16]. For the chemically active substances, no specific tests are defined but they should be considered in the design phase. The following references provide guidance for the design: - ISO 9223:2012 [16]: this can be used to calculate the corrosion losses of standard metals. - ISO 9226:2012 [i.3]: this can be used to determine corrosion losses of standard specimens.								
NOTE 12:	Void.								
NOTE 13:	(Mechanically active substances). The characteristic severities are much lower than the lowest test severity in IEC 60068-2-68 [13] Test Lb and therefore no test is required. This condition should be considered when designing the equipment and choosing components and materials. One possible test to evaluate the impact of corrosion due to dust can be found in Annex A.								
NOTE 14:	(Flora, fauna). The characteristic severity should be considered when choosing components and materials.								
NOTE 15:	No value is available in IEC 60721-3-3 [4] other than the description of the type of source, dripping water. If the product is likely to be exposed to falling drops from condensation or leakage from upper surfaces, IEC 60068-2-18 [15]: Ra 2 - drip box with a 2 m drop height, a tilt angle of 0°, and a 1 h duration - is the preferred method.								

Table 5: Test specification T 3.11: Enclosed locations having no temperature or humidity control - mechanical tests

Environmental parameter			Environmental Class 3.11	Environmental test specification T 3.11: In-use, Enclosed locations having no temperature or humidity control					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Note
Vibration	Random	ASD (m/s ²) ² /Hz	0,1	0,1 (m/s ²) ² /Hz	30 minutes in each direction	IEC 60068-2-64 [10]	Test Fh: Vibration, broad-band random	A	See note.
		frequency range (Hz)	5 to 200	5 Hz to 100 Hz					
Shocks	Shocks	shock spectrum duration (ms) acceleration (m/s ²) number of shocks directions of shocks	No						
NOTE: (Vibration, random). The test severity values are not specified in IEC 60068-2 series. The maximum test frequency has been reduced to 100 Hz, because between 100 Hz and 200 Hz the contribution is insignificant. Also at low and high frequency ends the ASD is reduced by 12 dB/octave.									
				Classes: 3.11/3.12					
				Acceleration RMS (for information only) 1,06 m/s ²					
Equipment under test shall be mounted in the "in-use" position. The equipment function shall be monitored throughout the test.									

4.5 Specification T 3.12: Locations having neither temperature nor humidity control

The specification in table 6 and table 7 shall apply to weatherprotected or partially weatherprotected locations having neither temperature nor humidity control.

Table 6: Test specification T 3.12: Locations having neither temperature nor humidity control- climatic tests

Environmental parameter			Environmental Class 3.12	Environmental test specification T 3.12: In-use, Locations having neither temperature nor humidity control					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Air temperature	Low	(°C)	-25	-25	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1
	High	(°C)	+55	+55	16 h	IEC 60068-2-2 [6]	Bb/Bd/Be: Dry heat	A	2
	Change	(°C) (°C/min)	0,5	-25 to +25 or -25 to +55 0,5	2 cycles t ₁ = 3 h	IEC 60068-2-14 [7]	Nb: Change of temperature	A	3

Environmental parameter			Environmental Class 3.12	Environmental test specification T 3.12: In-use, Locations having neither temperature nor humidity control					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Humidity	Relative	low (%)	5	none					4
		high (%) (°C)	100	93 +30	4 d	IEC 60068-2-78 [8]	Cab: Damp heat steady state	A	5
		condensation (%) (°C)	yes	90-100 +30	2 cycles	IEC 60068-2-30 [9]	Db: Damp heat cyclic Variant 1	A	6
	Absolute	low (g/m ³)	0,5	none					4
		high (g/m ³)	29						7
Air	Pressure	low (kPa)	70	none					8
		high (kPa)	106	none					8
	Speed	(m/s)	5,0	none					4
Water	Rain	intensity	wind driven						9
		low temperature	No						
	Other sources		dripping water						16
	Icing & frosting		yes	none	none	none	none	none	4
Radiation	Solar	(W/m ²)	700						10
	Heat	(W/m ²)	600						11
Chemically active substances	Sulphur	SO ₂ (mg/m ³)	[16]	none					12
		H ₂ S (mg/m ³)	[16]	none					12
	Chlorine	salt mist	[16]	none					12
		Cl (mg/m ³)	[16]	none					12
		HCl (mg/m ³)	[16]	none					12
	Nitrogen	NO _x (mg/m ³)	[16]	none					12
		NH ₃ (mg/m ³)	[16]	none					12
	Hydrogen fluoride HF	(mg/m ³)	[16]	none					12
	Ozone O ₃	(mg/m ³)	[16]	none					12
Mechanically active substances	Dust	sedimentation (mg/(m ² d))	No	none					
		suspension (mg/m ² h)	600	none					13
	Sand	(mg/m ³)	No	none					14
Flora and fauna	Micro organisms		mould, fungus, etc.	none					15
	Rodents, insects		rodents, etc.	none					15

Environmental parameter			Environmental Class 3.12	Environmental test specification T 3.12: In-use, Locations having neither temperature nor humidity control					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
NOTE 1:	(Air temperature, low). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If a cold start up test is performed, the characteristic severity should be used as a cold start up temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the cold start up test shall commence once low temperature stability is achieved.								
NOTE 2:	(Air temperature, high). The equipment under test shall remain operational throughout this test (without any damage or deterioration of performance, according to product specification). If two test temperatures are given, the lower test temperature applies if the equipment is protected against solar and heat radiation or the equipment is ventilated (natural or forced). The higher test temperature includes the heating effects of solar and/or heat radiation. If a high temperature start-up test is performed, the characteristic severity should be used as a high start up temperature, but it may be modified (within the class characteristic severity range) by the product specification. In this case, the high temperature start up-test shall commence once high temperature stability is achieved.								
NOTE 3:	(Air temperature, change). The change of temperature test is normally used to check design tolerance. IEC 60068-2-14 [7] Test Nb shall be used. For change of temperature of 0,5° C/min, the cooling gradient may be reduced to 0,2 °C/min where test chamber restrictions preclude a gradient of 0,5 °C/min.								
NOTE 4:	(Relative humidity, low). There is no IEC 60068-2 series test method for this parameter.								
NOTE 5:	(Humidity, relative, high). IEC 60068-2-78 [8] Test Cab shall be used with test values not higher than climatalogram limits for this class.								
NOTE 6:	(Condensation). IEC 60068-2-30 [9] Test Db shall be used with test values not higher than climatalogram limits for this class.								
NOTE 7:	(Humidity, absolute, high). This effect is considered to be partly included in the damp heat test IEC 60068-2-78 [8] Test Cab.								
NOTE 8:	(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 9:	(Water, rain). The effect of wind driven rain outside to the equipment in the weatherprotected or partly weatherprotected locations is included in IEC 60068-2-30 [9] Test Db. No test is recommended.								
NOTE 10:	(Radiation, solar). The higher test temperature as described in note 2 includes the heating effect of solar radiation. Photochemical tests can be made separately for components and materials.								
NOTE 11:	(Radiation, heat). The higher test temperature as described in note 2 includes the heating effect.								
NOTE 12:	(Chemically active substances). The characteristic severities are given in ISO 9223:2012 [16]. For the chemically active substances, no specific tests are defined but they should be considered in the design phase. The following references provide guidance for the design: - ISO 9223:2012 [16]: this can be used to calculate the corrosion losses of standard metals. - ISO 9226:2012 [i.3]: this can be used to determine corrosion losses of standard specimens.								

Environmental parameter			Environmental Class 3.12	Environmental test specification T 3.12: In-use, Locations having neither temperature nor humidity control					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
NOTE 13:	(Mechanically active substances). The characteristic severities are much lower than the lowest test severity in IEC 60068-2-68 [13] Test Lb and therefore no test is required. This condition should be considered when designing the equipment and choosing components and materials. One possible test to evaluate the impact of corrosion due to dust can be found in Annex A.								
NOTE 14:	(Mechanically active substances). The characteristic severities are much lower than lowest test severity in IEC 60068-2-68 [14] Test L and therefore no test is recommended. This condition should be considered when designing the equipment and when choosing components and materials.								
NOTE 15:	(Flora, fauna). The characteristic severity should be considered when choosing components and materials.								
NOTE 16:	No value is available in IEC 60721-3-3 [4] other than the description of the type of source, dripping water. If the product is likely to be exposed to falling drops from condensation or leakage from upper surfaces, IEC 60068-2-18 [15]: Ra 2 - drip box with a 2 m drop height, a tilt angle of 0°, and a 1 h duration - is the preferred method.								

Table 7: Test specification T 3.12: Locations having neither temperature nor humidity control- mechanical tests

Environmental parameter			Environmental Class 3.12	Environmental test specification T 3.12: In-use, Locations having neither temperature nor humidity control					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Vibration	Random	ASD (m/s ²) ² /Hz	0,1	0,01 (m/s ²) ² /Hz	30 minutes in each direction	IEC 60068-2-64 [10]	Test Fh: Vibration, broad-band random	A	See note.
		frequency range (Hz) axes of vibration	5 to 200	5 Hz to 100 Hz					
Shocks	Shocks	shock spectrum duration (ms) acceleration (m/s ²) number of shocks directions of shocks	No						
NOTE: (Vibration, random). The test severity values are not specified in IEC 60068-2 series. The maximum test frequency has been reduced to 100 Hz, because between 100 Hz and 200 Hz the contribution is insignificant. Also at low and high frequency ends the ASD is reduced by 12 dB/octave.									
				Classes: 3.11/3.12					
				Acceleration RMS (for information only)					
Equipment under test shall be mounted in the "in-use" position. The equipment function shall be monitored throughout the test.									

5 Earthquake test specification

5.0 General

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

The test specification is applicable to classes 3.10 to 3.12.

5.1 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 as specified in IEC 60068-2-6 [5] (test Fc), with the following parameter severities:

Frequency range:	1 Hz to 35 Hz
Vibration amplitude:	2 m/s ²
Sweep rate:	≤ 1 octave/min

NOTE 1: 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 60068-2-64 [10], using the following severities:

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

NOTE 2: The Acceleration Spectral Density (ASD) value may be reduced to 0,3 m²/s³ or less in case of sharp resonances.

5.2 Test conditioning

See table 8.

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 8: Test specification T 3.10 to T 3.12: Earthquake test

Environmental parameter			Environmental class 3.x	Environmental test specification T3.x: Earthquake test					
Type	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criteria	Notes
Earthquake	Time-history	RRS	see ETSI EN 300 019-1-3 [1]	figure 1, table 15		IEC 60068-2-57 [12]	Ff: time-history method	C	See note
		frequency range (Hz)	0,3 - 50	1 - 35					
		ZPA (m/s²)	15	15					
		axes		3	30 s				
		damping ratio (%)		2					
NOTE: (Earthquake). RRS (Required Response Spectrum). ZPA (Zero Period Acceleration). Equipment under test shall be 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. Single axis excitation is recommended; simultaneous multi axis excitation is also acceptable, but it is not recommended since, in general, multi axis testing gives less reproducible test results. 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. The strong part of the time history should be at least 15 s. The duration of each time history signal shall be 30 s. One time history shall be applied along each axis.									

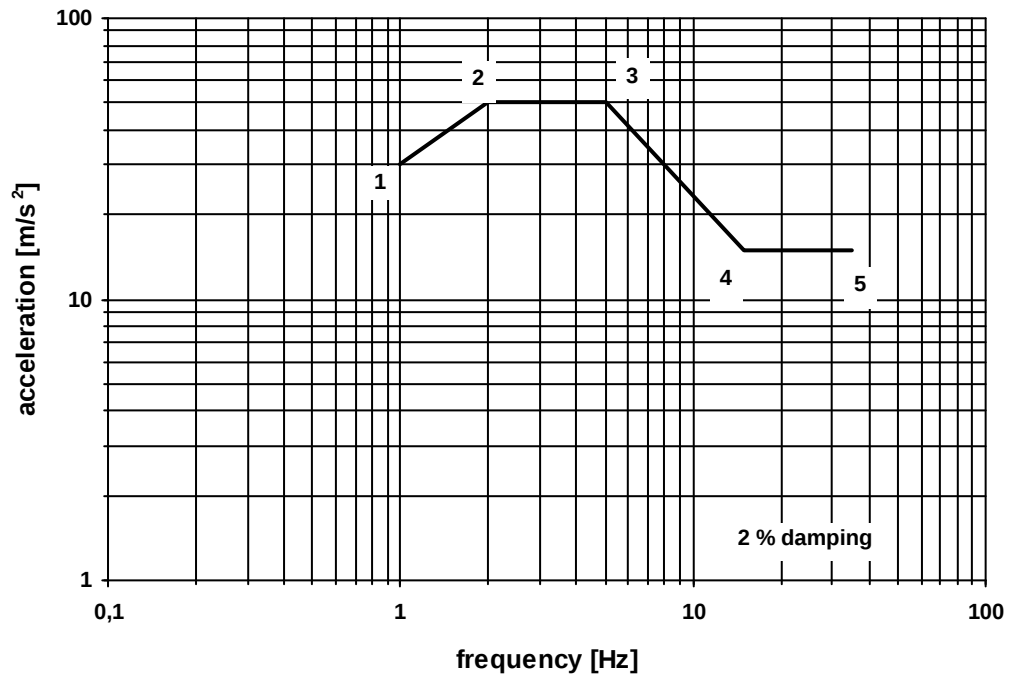


Figure 1: Earthquake Required Response Spectrum

Table 9: Acceleration co-ordinates for the Required Response Spectrum in figure 1

Co-ordinate point	Frequency [Hz]	Values for upper floor acceleration [m/s^2]
1	1	30
2	2	50
3	5	50
4	15	15
5	35	15

Annex A (informative): Impact of corrosion due to dust

A.0 General

Corrosion effects on the equipment may occur with a combination of dust and high humidity.

In this case a possible methodology of test is described in this annex.

To evaluate possible corrosion effect in PCB that can influence equipment performance, high relative humidity test is required to be executed after a suspension dust test.

A.1 Test condition

A.1.0 Introduction

The equipment need be positioned in an adequate test environment with the equipment in normal working conditions for test duration.

A.1.1 Dust test condition

Table A.1

Environmental test specification			
Duration	Reference	Method	Performance criteria
1d	IEC 60068-2-68 [13]	Lb	D

A.1.2 Corrosion test

After dust test on the equipment need be performed a test with the following conditions:

- Wind speed in the chamber should be less than 0,2 m/s.
- Dust density 30 mg/m³.
- Mixture of the Arizona Dust with diameter less than 75 um.
- Soluble salt should be used, with salt percentage 16 % by weight.

The salt may be composed by NaCl and Na₂SO₄, while the weight percentage of NaCl in salt is 65 %:

- Test duration 1 day.

A.1.3 Pass criteria

After the test the part under test need respect its normal operation condition (performance criteria B); in addition maintenance activities should be in line with operating/maintenance instruction.

A possible recommended test facility to perform all the test in same test environment is described in clause A.2.

A.2 Schematic Diagram of Suspension Dust Test Chamber

The dust test facility could be used as figure A.1.

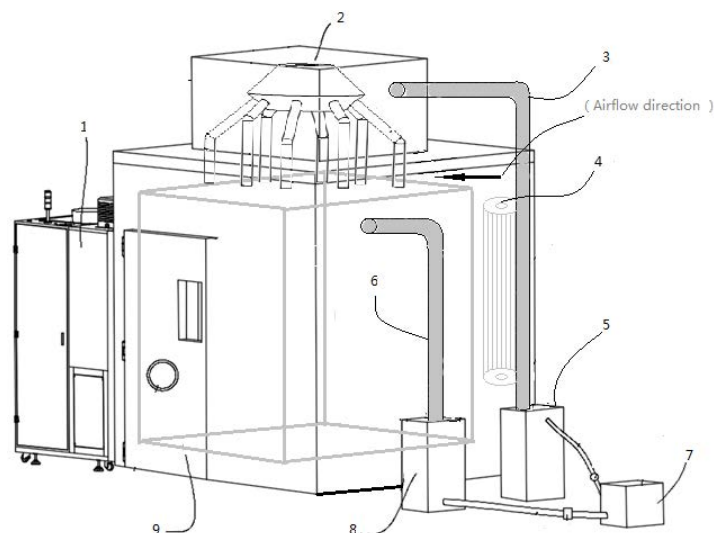


Figure A.1: Comprehensive test facility for temperature, humidity and dust

The comprehensive test device for temperature, humidity and dust facility consists of the following:

- 1) temperature, humidity, dust control unit and operation panel;
- 2) free fall dust distribution unit;
- 3) dust conveying pipeline;
- 4) the temperature control fan;
- 5) dust stirring unit and dust supplying device;
- 6) humidifying pipeline;
- 7) dry compressed air supply unit;
- 8) humidity supply unit;
- 9) double layer box for heat exchange.

Figure A.2 shows the cross section review of the chamber.

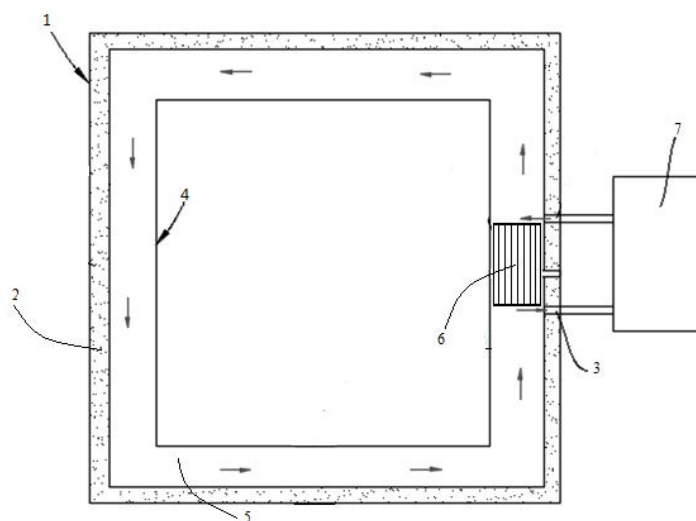


Figure A.2: Horizontal Cross Section Review of the Chamber

Double layer box for heat exchange:

- 1) double layer box for heat exchange;
- 2) the chamber outside wall;
- 3) refrigerant line;
- 4) the chamber inside wall;
- 5) circulating air duct;
- 6) heat exchanger;
- 7) heating refrigerating device.

In order to achieve the effect of uniform dust sedimentation, the inside chamber need keep wind speed less than 0,2 m/s, so take the double heat exchange box, through the air between the layers and air circulation, control the temperature of the inside chamber wall. The inner box air temperature is subjected to the conduction and radiation effect of the metal item to realize the temperature control of the inner box air.

Annex B (informative): Bibliography

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

History

Version	Date	Status
Edition 1	May 1994	Publication as ETSI ETS 300 019-2-3
Amendment 1	June 1997	Amendment 1 to 1 st Edition of ETSI ETS 300 019-2-3
Amendment 2	May 1998	Amendment 2 to 1 st Edition of ETSI ETS 300 019-2-3
V2.1.2	September 1999	Publication
V2.2.1	March 2003	Publication
V2.2.2	April 2003	Publication
V2.3.1	April 2013	Publication
V2.4.1	December 2015	Publication
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