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Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2: Specification of environmental tests; Sub-part 5: Ground vehicle installations Reference REN/EE-017009

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**ETSI** 

650 Route des Lucioles F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B Association à but non lucratif enregistrée à la Sous-Préfecture de Grasse (06) N° w061004871

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# Contents

Intell	ectual Property Rights	4
Forev	vord	4
Moda	l verbs terminology	4
1	Scope	5
2	References	5
2.1	Normative references	
2.2	Informative references	6
3	Definition of terms, symbols and abbreviations	6
3.1	Terms	6
3.2	Symbols	6
3.3	Abbreviations	6
4	Environmental test specifications	6
4.0	General	6
4.1	Equipment setup and configuration	
4.2	Performance criteria	
4.3	Specification T 5.1: Protected installations	7
4.4	Specification T 5.2: Partly protected installations	
4.5	Specification T 5.1: protected installation, climatic tests	
4.6	Specification T 5.1 and T 5.2: protected and partly protected installation, mechanical tests	
4.7	Specification T 5.2: partly protected installation, climatic tests	13
Anne	ex A (informative): Bibliography	16
Anne	ex (informative): Change History	17
Histo	ry	18

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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 standards EN Approval Procedure.

The present document is part 2, sub-part 5 of a multi-part deliverable. Full details of the entire series can be found in part 2, sub-part 0 [i.1].

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).

"must" and "must not" are NOT allowed in ETSI deliverables except when used in direct citation.

### 1 Scope

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

The tests defined in the present document apply to the use of equipment installed permanently or temporarily in ground vehicles and cover the vehicles and the environmental conditions stated in ETSI EN 300 019-1-5 [1].

The tests cover installations in vehicles powered by electric motors and combustion engines. Applications in combustion engine compartments are excluded.

### 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.

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

[1]	ETSI EN 300 019-1-5 (04-2003): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-5: Classification of environmental conditions; Ground vehicle installations".
[2]	IEC 60068-2-1 (03-2007): "Environmental testing - Part 2-1: Tests - Test A: Cold".
[3]	Void.
[4]	Void.
[5]	Void.
[6]	Void.
[7]	IEC 60068-2-2 (07-2007): "Environmental testing - Part 2-2: Tests - Test B: Dry heat".
[8]	IEC 60068-2-14 (01-2009): "Environmental testing - Part 2-14: Tests - Test N: Change of temperature".
[9]	IEC 60068-2-30 (08-2005): "Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)".
[10]	IEC 60068-2-64 (04-2008): "Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance".
[11]	IEC 60068-2-27 (02-2008): "Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock".
[12]	Void.
[13]	Void.
[14]	Void.

- [15] IEC 60068-2-18 (03-2017): "Environmental testing Part 2-18: Tests Test R and guidance: Water".
- [16] IEC 60068-2-78 (10-2012): "Environmental testing Part 2-78: Tests Test Cab: Damp heat, steady state".

#### 2.2 Informative references

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1]	ETSI EN 300 019-2-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-0: Specification of environmental tests; Introduction".
[i.2]	IEC 60068-2 (all parts): "Environmental testing - Part 2: Tests".
[i.3]	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.4]	IEC 60068-2-68 (08-1994): "Environmental testing - Part 2: Tests - Test L: Dust and sand".
[i.5]	IEC 60721-3-5 (03-1997): "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 5: Ground vehicle installations".

### 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.3] apply.

### 3.2 Symbols

For the purposes of the present document, the symbols given in ETSI EN 300 019-1-0 [i.3] apply.

#### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 300 019-1-0 [i.3] apply.

### 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 defined in to clauses 4 and 5 of ETSI EN 300 019-1-5 [1].

ETSI EN 300 019-2-0 [i.1] 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.

7

### 4.2 Performance criteria

The following performance criteria shall apply in the 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 Specification T 5.1: Protected installations

The tests specifications T 5.1 of the present document shall apply to equipment intended for use in weather protected heated locations in vehicles which are used in areas with or without well-developed road systems depending on the selected IEC mechanical class. See tables 1, 2 and 2a.

### 4.4 Specification T 5.2: Partly protected installations

The tests specifications T 5.2 of the present document shall apply to equipment intended for use in vehicles, excluding only non-weather protected use in unheated vehicles at extremely low temperature conditions. This test specification applies to equipment intended for use in vehicles in areas with or without developed road systems, depending on the selected IEC mechanical class, see tables 2 and 3.

### 4.5 Specification T 5.1: protected installation, climatic tests

The specification in table 1 shall apply to protected installation described in ETSI EN 300 019-1-5 [1].

#### Table 1: Test specification T 5.1: protected installation - climatic tests

	Environmental	parameter	Environmental Class 5.1		Environmental test specification T5.1: Vehicle, protected installation						
Туре	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criterion	Notes		
	Low	(°C)	-25	-25	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1		
	High	(°C)	+40	+40 or +55	16 h	IEC 60068-2-2 [7]	Bb/Bd/Be: Dry heat	A	2		
Air temperature		(°C)	+70	+70 or +85	16 h	IEC 60068-2-2 [7]	Bb/Bd/Be: Dry heat	A	2		
-		rapid (°C)	-25 to +30	None					3a		
	Change	(°C) gradual (°C/min)	-25 to +30 5	-25/+30	5 cycles t <sub>1</sub> = 3 h	IEC 60068-2-14 [8]	Na: Change of temperature	A	3b		
		(°C) (°C/min)		None					3c		
Temperature	Change	air/water (°C)	+60/+5	None					4		
-	-	air/snow (°C)	+60/-5	None					4		
		slow temperature (%) change (°C)	95 +40	93 +40	96 h	IEC 60068-2-78 [16]	Cb: Damp heat, steady state	A	5		
		(%) rapid temperature (°C)	95 -25 to +30 not d)	90-100 +40	2 cycles	IEC 60068-2-30 [9]	Db: Damp heat, cyclic, Variant 2	A	6a		
	Relative	change (%) (°C)	95 +10 to +70 d)	90-100 +55	2 cycles	IEC 60068-2-30 [9]	Db: Damp heat, cyclic, Variant 2	A	6b		
Humidity		low (%) (°C)	10 +30	None					8		
	absolute	rapid temperature (g/m <sup>3</sup> ) change (°C)	60 +70 to +15	None					7		
Air	pressure	low (kPa)	70	None					9		
	Speed	(m/s)	20	None					8		
	Rain	Intensity (mm/min)	No	Not Applicable							
Water	other sources	velocity (m/s)	- ] -	None					8		
	wetness		wet surfaces	None					8,12		
Radiation	Solar	(W/m <sup>2</sup> )		None					13		
	Heat	(W/m <sup>2</sup> )	600	None					13		

	Environmental	parameter	Environmental Class 5.1		Environmental test specification T5.1: Vehicle, protected installation						
Туре	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criterion	Notes		
	Sulphur	SO <sub>2</sub> (mg/m <sup>3</sup> )	0,3 to 1,0	None					14		
		$H_2S$ (mg/m <sup>3</sup> )	0,1 to 0,5	None					14		
		sea salts	salt mist	None					14		
Chemically active substance Nitr by fluc active substances San Flora and mic Flora and mic Flora and mic Flora and mic fluids Cort fluids Flui Gree batt Flui Substances San Flora and mic Flora and m	Chlorine	road salts	solid salt, salt water	None					14		
		HCI (mg/m <sup>3</sup> )	0,1 to 0,5	None					14		
	Nitrogen	NO <sub>x</sub> (mg/m <sup>3</sup> )	0,5 to 1,0	None					14		
	-	NH <sub>3</sub> (mg/m <sup>3</sup> )	1,0 to 3,0	None					14		
	hydrogen fluoride	HF (mg/m <sup>3</sup> )	0,01 to 0,03	None					14		
	ozone	O <sub>3</sub> (mg/m <sup>3</sup> )	0,05 to 0,1	None					14		
,	dust (Sedimentation)	other than cabin (mg/(m <sup>2</sup> h)) cabin only (mg/(m <sup>2</sup> h))	3,0 1,0	None					15 15		
	sand	(mg/m <sup>3</sup> )	0,1	None					15		
Flora and	micro organism		mould, fungus, etc.	None					16		
	rodents, insects		rodents, etc.	None					16		
		motor	No	Not Applicable							
	Oil	gearbox	No	Not Applicable							
		hydraulic		None					17		
Contaminating		transformer		None					17		
fluids	Fluid	brake	Electrical engine	None					17		
Contaminating fluids		cooling	compartment only	None					17		
	Grease			None					17		
	battery electrolyte			None					17		
	Fuel		No	Not Applicable							
NOTE 2: (Ài In v and In u hea	r temperature, high) ventilated compartm d heat radiation. The unventilated and eng at radiation. The higl	ent and outdoor air condition higher test temperature inc gine compartment conditions her test temperature include	ns, the lower test tem ludes solar radiation. s, the higher test tem	perature is equal to	the characteri	stic severity and ref	ers to equipment to	be protected aga	inst solar		
3a) No Na 3b) The cor cor 3c)	test is required at e (gradual) EIEC 60068-2-14 [8 npartment the test to npartment. (gradual)	ge). quipment level. The rapid ch ] Test Na has been chosen emperature change near up erity refers to the engine cor	since the rapid tempo per limit is considered	erature change is c d to be less severe	onsidered to be	e more severe than g	gradual temperatur	e change. For en	gine		

	Environmental p	arameter	Environmental Class 5.1				est specification T tected installation	5.1: Vehicle,	
Туре		Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criterion	Notes
NOTE 4:	(Temperature, change,								
		partly included in IEC 6006					compartment and s	should be conside	red when
		nt and when choosing comp	oonents and materials.	This No test is re	quired at equip	oment level.			
NOTE 5:	(Humidity, relative, slow								
		e nearest preferred values i	n IEC 60068-2-78 [16]	Test Cb and the	minor differenc	ces in humidity condi	tion is considered	to be insignificant	and within
	normal measurement to								
NOTE 6:	(Humidity, relative, rapid								
		sen rather than variant 1 du	le to the high tempera	ture/absolute hum	idity involved a	and the difficulty in m	aintaining tolerand	ces in most cham	bers with heat
	producing specimen.								
		ic severity does not apply t							
NOTE 7		ic severity applies to near I	errigerated air conditio	oning.					
NOTE 7:	(Humidity, absolute, rap			1 4 4	-1				
		uded in IEC 60068-2-30 [9]			d.				
	(Air pressure, low).	8-2 [i.2] test method for thi	s parameter, no tests a	are defined.					
NOTE 9.		d for normal applications, b	acquire the offect of a	ir proceuro ie ovali	istad at the co	mpopont loval			
NOTE 10:		d for normal applications, b		i pressure is evan					
NOTE 11:									
	(Water, wetness).								
		ontact with wet surface, the	corrosion effect and d	egeneration effect	t has to be con	sidered			
NOTE 13	(Radiation, solar, heat).			egeneration enco					
		rces is included in high terr	perature test. Photocl	nemical tests can	be made sepa	rately for component	s and materials.		
NOTE 14:	(Chemically active subs								
		ubstances, the characteristi	c severity should be c	onsidered when cl	noosing compo	onents and materials	. No test is require	ed at equipment le	evel.
		s of chemically active subst			5 1		•		
	(Mechanically active sul								
	The characteristic sever	rities are much lower than I	owest test severity in I	EC 60068-2-68 [i.	4] Test Lb and	therefore no test is	required. This con	dition should be c	onsidered
	when designing the equ	ipment and when choosing	components and mat	erials.					
NOTE 16:	(Flora, fauna).								
	The characteristic seven	rity should be considered w	hen designing the equ	uipment and when	choosing com	ponents and materia	als.		
NOTE 17:	(Contaminating fluids).								
		al engine compartment only	<ol> <li>The characteristic se</li> </ol>	verity should be c	onsidered whe	en designing the equi	ipment and when	choosing compon	ents and
	materials.								

#### 4.6 Specification T 5.1 and T 5.2: protected and partly protected installation, mechanical tests

The specification in table 2 shall apply to protected (T 5.1) and partly protected (T 5.2) installation described in ETSI EN 300 019-1-5 [1]. Test specifications for random vibrations in Table 2 are based on characteristics severity of IEC 60721-3-5 [i.5] class M2.

	Environment	al parameter		E	nvironmental Class 5.1	Environmental test specification T5.1 and 5.2: Vehicle, protected and partly protected installations							
Туре	e Parameter	Detail parameter		Characteristic Severity		Test severity	Duration	Reference	Method	Performance criterion	Notes		
	sinusoidal	displacement acceleration frequency range	(mm) (m/s <sup>2</sup> ) (Hz)	3,3 2 to 9 500	3 15 9 to 200 200 to	None					1		
Vibration	random	ASD frequency range axes of vibration	(m²/s³) (dB/oct) (Hz)	1 10 to 2	0,3 00 200 to 500	1 5 to 20 20 to 500 3	3 x 30 min	IEC 60068-2-64 [10]	Fh: Vibration, broad-band random (digital control)	A	2		
Shocks	shocks	shock spectrum duration acceleration number of shocks directions shocks	(ms) (m/s <sup>2</sup> )	Type I 11 100	Type II 6 300	half sine 6 300 6	3 in each direction	IEC 60068-2-27 [11]	Ea: Shock	A	3		
SHUCKS	bump	acceleration duration number of bumps directions of bumps	(m/s²) (ms)	No		100 11 6	100 in each direction	IEC 60068-2-27 [11]	Eb: Bump	A	4		
NOTE 1:	(Vibration, sinusoid			liatia ta	at far this sanditis.	a thanafana na i		e eu line d					
NOTE 2:	(Vibration, random)	s considered to be a s characteristics sev					Sinusoidai test is f	equirea.					
NOTE 3: NOTE 4:	(Shock). The severities are g	given as peak values		oponac		, [] 0000 WZ.							

#### Table 2: Test specification T5.1: protected installation Test specification T5.2: partly protected installation

The severities are given as peak values. Bump test is required in addition to shocks as the number of expected shocks is high. Bumps are of greatest significance in the vertical direction. If only one operational position is specified, 100 bumps have to be applied along that direction only.

The specification in table 2a shall apply to protected (T 5.1) and partly protected (T 5.2) installation described in ETSI EN 300 019-1-5 [1]. Test specifications for random vibrations in Table 2a are based on characteristics severity of IEC 60721-3-5 [i.5] class M3.

	Environmental p	arameter	Environmental Class 5.1 & 5.2			tal test specification ted and partly protect			
Туре	Parameter	Detail parameter	Characteristic Severity	Test severity	Duration	Reference	Method	Performance criterion	Notes
	sinusoidal	displacement (mm) acceleration (m/s <sup>2</sup> ) frequency range (Hz)		None					1
Vibration	random	ASD (m <sup>2</sup> /s <sup>3</sup> ) (dB/oct) frequency range (Hz) axes of vibration		2 5 to 20 3	3 × 30 min	IEC 60068-2-64 [10]	Fh: Vibration, broad-band random (digital control)	A	2
Shocks	shocks	shock spectrum duration (ms) acceleration (m/s <sup>2</sup> ) number of shocks directions of shocks	11 6	half sine 6 1 000 6	3 in each direction	IEC 60068-2-27 [11]	Ea: Shock	A	3
	bump	acceleration (m/s <sup>2</sup> ) duration (ms) number of bumps directions of bumps		100 11 6	100 in each direction	IEC 60068-2-27 [11]	Eb: Bump	A	4
NOTE 1: NOTE 2:	Random vibration is con (Vibration, random).	nsidered to be a more reali aracteristics severity corres			usoidal test is req	uired.		·	<u>.</u>
NOTE 3: NOTE 4:	(Shock). The severities are given (Bump).				number of expecte	ed shocks is high. Bu	umps are of g	reatest significa	ance in

# Table 2a: Test specification T5.1: Protected installation Test specification T5.2: Partly protected installation

the vertical direction. If only one operational position is specified, 100 bumps have to be applied along that direction only.

### 4.7 Specification T 5.2: partly protected installation, climatic tests

The specification in table 3 shall apply to partly protected installation described in ETSI EN 300 019-1-5 [1].

#### Table 3: Test specification T 5.2: partly protected installation - climatic tests

	Environmental	parameter	Environmental Class 5.2			tal test specification tal test specification tallated installated			
Туре	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criterion	Notes
	Low	(	°C) -40	-40	16 h	IEC 60068-2-1 [2]	Ab/Ad/Ae: Cold	A	1
	High	(	°C) +40	+40 or +55	16 h	IEC 60068-2-2 [7]	Bb/Bd/Be: Dry heat	A	2
Air	-	(	°C) +70	+70 or +85	16 h		Bb/Bd/Be: Dry heat	A	2
temperature		rapid (	°C) -40 to +30	None					3a
	change	gradual (°C/n	°C)         -40 to +30           iin)         5           °C)         -40 to +70	-40 to +30	5 cycles t <sub>1</sub> = 3 h	IEC 60068-2-14 [8]	Na: Change of temperature	A	3b 3c
			nin) 10 °C) -40/+5	None					4a
Temperature	change		°C) +70/+5	None					4b
		air/ snow (	°C) +70/-5	None					4b
		slow temperature change (	%) 95 °C) +45	93 +40	96 h	IEC 60068-2-78 [16]	Cb: Damp heat, steady state	A	5
	relative		%) 95 °C) -45 to +30	90 to 100 +40	2 cycles	IEC 60068-2-30 [9]	Db: Damp heat, cyclic, variant 2	A	6
Humidity		change	%) 95 °C) +10 to +70	90 to 100 +55	2 cycles	IEC 60068-2-30 [9]	Db: Damp heat, cyclic, variant 2	A	6
		(	%) 10 °C) +30	None					8
	absolute	rapid temperature (g/ change (	n <sup>3</sup> ) 60 PC) +70 to +15	None					7
Air	pressure	low (k	Pa) 70	None					9
	speed		/s) 20	None					8
	rain	intensity mm/	nin 6	0,01 m <sup>3</sup> /min; 90 kPa	3 min/m <sup>2</sup> or 15 min	IEC 60068-2-18 [15]	Rb: Impacting water Method 1.2	A	10
Water	other sources	velocity (n	ı/s) 1	None					11
	wetness		wet surfaces	None					8,12

	Environmental	parameter	Environmental Class 5.2			tal test specification T rtly protected installati			
Туре	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criterion	Notes
Radiation	solar	(W/m	<sup>2</sup> ) 1 120	None					13
	heat	(W/m (W/m	<sup>2</sup> ) 600 not c) 2) 1 120 c)	None					13
	sulphur		<sup>3</sup> ) 0,3 to 1,0	None					14
			<sup>3</sup> ) 0,1 to 0,5	None					14
		sea salts	salt mist	None					14
Chemically	chlorine	road salts	solid salt salt water	None					14
Active		HCI (mg/m	<sup>3</sup> ) 0,1 to 0,5	None					14
h	nitrogen	NO <sub>x</sub> (mg/m	<sup>3</sup> ) 0,5 to 1,0	None					14
		NH <sub>3</sub> (mg/m	<sup>3</sup> ) 1,0 to 3,0	None					14
	hydrogen fluoride		<sup>3</sup> ) 0,01 to 0,03	None					14
	ozone	O <sub>3</sub> (mg/m	<sup>3</sup> ) 0,05 to 0,1	None					14
Mechanically	dust (Sedimentation)	other than cabin (mg/(m <sup>2</sup> h cabin only (mg/(m <sup>2</sup> h	)) 3,0 )) 1,0	None					15 15
active	sand	other than cabin (mg/m	<sup>3</sup> ) 0,1	None					15
substances		cabin only	No	Not Applicable					15
-lora and	micro organisms	•	mould, fungus, etc.	none	None				16
Fauna	rodents, insects		rodents, etc.	none	None				16
		motor	No	Not Applicable					
	oil	gearbox	No	Not Applicable					
		hydraulic		None					17
Contaminating		transformer		None					17
Fluids	fluid	brake	Electrical engine	None					17
		cooling	compartment only	None					17
	grease			None					17
	battery electrolyte			None					17
	fuel		No	Not Applicable					

NOTE 1: (Air temperature, low). The characteristic severity can be used as a cold start up temperature. Other cold start temperature can be used as defined in the product specification. NOTE 2: (Air temperature, high).

In ventilated compartment and outdoor air conditions, the lower test temperature is equal to the characteristic severity and refers to equipment to be protected against solar and heat radiation. The higher test temperature includes solar radiation.

In unventilated and engine compartment conditions, the higher test temperature is equal to the characteristic severity and refers to equipment to be protected against solar and heat radiation. The higher test temperature includes heat trap effect of direct solar radiation.

NOTE 3: (Air temperature, change).

3a) (rapid)

No test is required at equipment level. The rapid change of temperature test is normally used to check design tolerancing. This effect is included in IEC 60068-2-14 [8] Test Na. 3b) (gradual)

The IEC 60068-2-14 [8] Test Na has been chosen since the rapid temperature change is considered to be more severe than gradual temperature change. For engine compartment the test temperature change near upper limit is considered to be less severe and this effect is covered by test Bb. This test is not applicable to engine compartment.

		Environmental p	arameter	Environmental Class 5.2			al test specification <sup>-</sup> ly protected installat			
Туре	)	Parameter	Detail parameter	Characteristic severity	Test severity	Duration	Reference	Method	Performance criterion	Notes
	3c)	(gradual)		·						
			verity refers to the engine	compartment. No te	sts are required.					
IOTE 4:			e; air/water, air/snow)							
			is partly included in IEC 6			verity should be con	sidered when desigi	ning the equipme	ent and when cho	osing
	comp	onents and mate	erials. This No test is requ	uired at equipment le	vel.					
	4a)									
	The c	haracteristic sev	verity does not cover the	engine compartment						
	4b)									
	The c	haracteristic sev	erity covers the engine c	ompartment.						
NOTE 5:	(Hum	idity, relative, slo	w temperature change).							
	These	e severities are t	he nearest preferred valu	ies in IEC 60068-2-7	8 [16] Test Cb and the m	ninor differences in h	umidity condition is	considered to be	insignificant and	l within
	norma	al measurement	tolerances.				•		U U	
VOTE 6:	(Hum	idity, relative, rap	oid temperature change).							
			osen rather than variant		nperature/absolute humic	dity involved and the	difficulty in maintair	ning tolerances ir	n most chambers	with hea
		cing specimen.		Ŭ				0		
	6a)		stic severity does not ap	oly to near refrigerate	ed air conditioning.					
	6b)		stic severity applies to ne							
IOTE 7:	(Humi		apid temperature change		5					
			uded in IEC 60068-2-30		itional tests are required					
NOTE 8:			068-2 [i.2] test method fo							
NOTE 9:	(Air p	ressure, low).		•						
			ed for normal application	s, because the effec	t of air pressure is evalua	ated at the compone	nt level.			
NOTE 10:					•					
			Fest Rb method 1.2 has b	been chosen even th	ough it does not imitate r	normal rain. It is a sir	mple hand held show	ver test, which is	easy to perform	and can
			specimen design is adeq						<i>y</i> 1	
NOTE 11:	(Wate	er, other sources	).		C	U				
			ed because the effect is	alreadv included in II	EC 60068-2-18 [15] Test	Rb.				
		er, wetness).		,						
	Ìf the	equipment is in o	contact with wet surface,	the corrosion effect	and degeneration effect	has to be considered	ł.			
		ation, solar, heat			5					
		nically active sub								
			substances, the characte	eristic severity should	be considered when ch	posing components	and materials. No te	st is required at	equipment level.	
			es of chemically active su			5 1				
		nanically active s								
			erities are much lower th	an lowest test severi	ty in IEC 60068-2-68 [i.4	] Test Lb and therefore	ore no test is require	d. This conditior	n should be consi	dered
			quipment and when choo			•				
NOTE 16:				- ·						
-			erity should be considere	ed when designina th	e equipment and when o	choosing component	s and materials.			
NOTE 17:		aminating fluids)		5 5 5						
			cal engine compartment	only. The characteris	tic severity should be co	nsidered when desid	gning the equipment	and when choo	sing components	and
		ials.	<b>J</b>	-						

## Annex A (informative): Bibliography

- ETSI ETR 100 035: "Equipment Engineering (EE); Environmental engineering; Guidance and terminology".
- IEC 60068-1: "Environmental testing. Part 1: General and guidance".
- IEC 60721-3-3: "Classification of environmental conditions Part 3-3: Classification of groups of environmental parameters and their severities Stationary use at weatherprotected locations".

# Annex (informative): Change History

Date	Version	Information about changes	
10/2020		Changes made in respect to V.3.0.0 are the addition of performance criteria and the updates of reference standards and test methods	

# History

Document history					
Edition 1	May 1994	Publication as ETSI ETS 300 019-2-5			
V2.1.2	September 2001	Publication			
V3.0.0	December 2002	Publication			
V3.0.7	June 2021	EN Approval Procedure	AP 20210912: 2021-06-14 to 2021-09-13		