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Okoljski preskusi - 2-1. del: Preskusi - Preskusi a: Mraz

Environmental testing - Part 2-1: Tests - Test a: Cold

Umgebungseinflüsse - Teil 2-1: Prüfverfahren - Prüfung A: Kälte

Essais d'environnement - Partie 2-1: Essais - Essai a: Froid

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104/1046/CDV

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CLOSING DATE FOR VOTING:

2024-07-12

104/1020/CD, 10	04/1037A/CC			
IEC TC 104: ENVIRONMENTAL CONDITIONS, CLASSIFICATION	N AND METHODS OF TEST			
SECRETARIAT:	SECRETARY:			
Sweden	Mr Henrik Lagerström			
OF INTEREST TO THE FOLLOWING COMMITTEES:	Proposed Horizontal Standard:			
	Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.			
FUNCTIONS CONCERNED:				
☐ EMC ☐ ENVIRONMENT	QUALITY ASSURANCE SAFETY			
SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING			
Attention IEC-CENELEC parallel voting	andards			
The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.	dards.iteh.ai) nt Preview			
The CENELEC members are invited to vote through the CENELEC online voting system.	00.0000.0.1.2004			
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Environmental testing - Part 2-1: Tests - Test A:	Cold			
PROPOSED STABILITY DATE: 2031				
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NOTE FROM TC/SC OFFICERS:				

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81			INTERNATIONAL ELECTROTECHNICAL COMMISSION	
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83 84			ENVIRONMENTAL TESTING -	
85			ENVINORMENTAL TESTING	
86			Part 2-1: Tests – Test A: Cold	
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88			FOREWORD	
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90 91 92 93 94 95 96 97 98	1)	all nacco-o in acc Publ prep may with	International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising ational electrotechnical committees (IEC National Committees). The object of IEC is to promote international peration on all questions concerning standardization in the electrical and electronic fields. To this end and Idition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, icly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their aration is entrusted to technical committees; any IEC National Committee interested in the subject dealt with participate in this preparatory work. International, governmental and non-governmental organizations liaising the IEC also participate in this preparation. IEC collaborates closely with the International Organization for dardization (ISO) in accordance with conditions determined by agreement between the two organizations.	
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121 122	· · ·			
123	Th	is se	eventh edition cancels and replaces the sixth edition published in 2007.	
124	Th	e m	ajor changes with regard to the previous edition concern:	
125		a)	Revision of the introduction and scope;	
126		b)	Including new figures and symbols for clarification purposes;	
127 128		c)	Clarification of the test procedure for ascertaining high or low air velocity in the test chamber;	
129		d)	Clarification of the requirements for measuring points around, on or in specimens;	
130 131		e)	Reintroducing the nomogram procedure for the correction of the conditioning temperature when testing with high air velocity (Test Ad and Test Ae);	
132		f)	Revision of the temperature tolerances of the test;	

g) Revision of standardized requirements for the relevant specification and test report;

h) Including the advantages and disadvantages of the testing procedures.

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136 The text of this standard is based on the following documents:

FDIS	Report on voting

137

- Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.
- 140 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.
- 141 A list of all the parts in the IEC 60068 series, under the general title Environmental testing, can
- be found on the IEC website.
- 143 The committee has decided that the contents of this publication will remain unchanged until the
- maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data
- related to the specific publication. At this date, the publication will be
- reconfirmed,
- 147 withdrawn,
- replaced by a revised edition, or
- 149 amended.

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151	INTRODUCTION
152 153 154 155 156 157 158	The working ranges and performance of equipment and machinery can be significantly affected or limited by ambient temperatures. The degree of this influence may depend on temperature distributions of the environment as well as temperatures on components of the device itself. In order to determine the existing degree of influence and to ensure that the device is suitably designed for its ambient conditions, tests are carried out with cold and/or dry heat (IEC 60068-2-2). During the test, it is to be taken into account whether the tested device itself emits heat or not.
159 160 161 162 163	Reducing the air flow within the test chamber may be required to reduce the air velocity at heat-dissipating specimens. This can be achieved by using air baffles or adjusting the air flow of the test chamber. If the reduction of air velocity is not practical or possible due to the required test conditions, this document provides an alternative test procedure without the need for adjustable air flow as well as guidance on selecting the applicable test procedure.

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	165 166	ENVIRONMENTAL TESTING -
	167	Part 2-1: Tests – Test A: Cold
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	169 170	
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1	171	1 Scope
	172	This document specifies temperature tests at low temperatures, generally referred to as "cold
	173 174	tests", that are applicable to non-heat-dissipating and heat-dissipating specimens, to determine the ability of components, equipment, or other articles to be used, transported or stored at low
	175	temperature.
	.=0	
	176 177	This document is applicable to energized as well as not energized specimens, that normally achieve temperature stability during the test. The specimens can be packed or unpacked in the
	178	test.
	4=0	
	179 180	This document does not specify tests to determine the impact of temperature changes on specimens.
,	181	2 Normative references
1	182	IEC 60068-1, Environmental testing – Part 1: General and guidance
	183 184	IEC 60068-5-2, Environmental testing – Part 5: Guide to drafting of test methods – Terms and definitions
	185	3 Terms and definitions 3://standards.iteh.ai)
	186 187	For the purposes of this document, the definitions given in IEC 60068-1 and IEC 60068-5-2, as well as the following definitions, apply.
1	188	ISO and IEC maintain terminology databases for use in standardization at the following 168-2-1-2024
	189	addresses:
1	190	IEC Electropedia: available at https://www.electropedia.org/
1	191	ISO Online browsing platform: available at https://www.iso.org/obp
,	192	3.1
	193	low air velocity
	194 195	velocity of conditioning airflow within a working space which is sufficient to maintain conditions but low enough so that the temperature at any point on the test specimen is not reduced by
	196	more than 5 K by the influence of the circulation of the air
	197	3.2
	197 198	high air velocity
1	199	velocity of conditioning airflow within a working space, which in order to maintain conditions,
	200 201	also reduces the temperature at the relevant point or points on the test specimen by more than 5 K by the influence of the circulation of the air
2	200	also reduces the temperature at the relevant point or points on the test specimen by more than

202 **4 Symbols**

T_{A}	low conditioning temperature
T_{A}	corrected low conditioning temperature (nomogram procedure)
T_{STD}	temperature of standard atmospheric conditions for measurement and test (15 °C to 35 °C)
T _{Ca}	measured ambient temperature in the vicinity of the specimen, either in the test chamber or the laboratory air, without forced convection (see 5.2)
T_{Cb}	measured test chamber temperature with forced convection (see 5.2)
T_{S}	temperature of the energized specimen at the specified conditioning temperature
T_{Sa}	temperature of the energized specimen at the temperature of standard atmospheric conditions without forced convection (see 5.2)
T_{Sb}	temperature of the energized specimen at the temperature of standard atmospheric conditions with forced convection (see 5.2)
ΔT_{S}	temperature difference between the energized specimen and the air
$\Delta T_{Sa/b}$	temperature difference between the energized specimen without forced convection $(T_{\rm Sa})$ and with forced convection $(T_{\rm Sb})$ at the temperature of standard atmospheric conditions
dT_{R}	temperature change rate
t _s	stabilization time of specimen temperature before exposure to the low conditioning temperature
t _{s0}	stabilization time of specimen temperature after energizing
<i>t</i> ₁	exposure time of the specimen to the low conditioning temperature

5 Application of tests for non-heat-dissipating specimens versus tests for heat-dissipating specimens Tark 180 60068-2-1-2024

205 **5.1 General**

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- 206 This test is subdivided as follows:
- 207 Test Ab, Cold for non-heat-dissipating specimens;
- 208 Test Ad, Cold for heat-dissipating specimens that are energized after initial temperature stabilization;
- 210 Test Ae: Cold for heat-dissipating specimens that are energized throughout the test.
- A specimen, while energized, is considered to be heat-dissipating only if the hottest point on its surface or any other relevant point, measured in free air conditions (i.e., with low air velocity
- circulation), is more than 5 K above the ambient temperature of the surrounding atmosphere
- 214 after temperature stability has been reached (see 3.11 of IEC 60068-1).
- NOTE 1 In some cases, for example for test specimens with air-permeable housings, the relevant measuring points can be located inside the external housing.
- 217 Tests of heat-dissipating and non-heat-dissipating specimens generally differ in the air velocity
- 218 applied. Non-heat-dissipating specimens are typically tested at high air velocity to reduce the
- 219 time required to reach temperature stability. Heat-dissipating specimens are generally tested
- at low air velocity to allow for the formation of local hotspots similar to those that would appear

- 221 in installed applications. Annex A gives an overview of the relevant test conditions and shows
- 222 the relationship of suffixes between Test A: Cold and Test B: Dry heat.
- 223 Testing with low air velocity may not apply to heat-dissipating specimens with an external
- 224 housing and built-in fan, provided that the representative measuring point is located at a point
- 225 inside the external housing which is not affected by external air movement. It should be ensured
- 226 that the induced air movement does not interfere with the operation of the built-in fan, if not
- 227 specified otherwise.
- 228 229 NOTE 2 The induced air movement can have an influence on the operation of a built-in fan if both air movements
- act either in the same or opposite direction.
- 230 Where it is not feasible to test heat-dissipating specimens with low air velocity, e.g., due to the
- 231 required test conditions, Annex B gives an alternative procedure for testing with high air
- 232 velocity.
- The relevant specification shall state which test procedure shall be applied. The advantages 233
- 234 and disadvantages of both test procedures should be considered when specifying the intended
- 235 test. For more information on these advantages and disadvantages, see Annex C.
- 236 When the relevant specification calls for a storage or transportation test or does not specify an
- 237 applied load during the test, Test Ab applies.

238 5.2 Ascertaining high or low air velocity in the test chamber

- 239 To ascertain, whether high or low air velocity prevails in the test chamber, the cooling effect of
- the air movement on the specimen shall be determined. Therefore, the specimen's temperature 240
- 241 shall be measured with and without forced convection by the test chamber's fan. Both
- 242 temperatures shall be compared in accordance with the following procedure. It is recommended
- 243 to ascertain the prevailing air velocity in the test chamber for every specimen, since the
- 244 occurring cooling effect can vary for different specimens.
- 245 Under standard atmospheric conditions for measurements and test (see IEC 60068-1) with an
- 246 air velocity <0,2 m/s, achieved without forced convection, the heat-dissipating specimen shall
- 247 be switched on or electrically loaded as specified for the low temperature at which the test is to
- 248 be carried out.

- When temperature stability of the specimen has been reached, the temperature of a 249
- 250 representative point around or on the specimen and the ambient temperature T_{Ca} shall be
- 251 measured using a suitable monitoring device. Either the hottest point or any point of particular
- 252 interest on the specimen may be used as representative point for measuring the temperature
- 253 of the energized specimen T_{Sa} without forced convection.
- 254 NOTE 1 To determine the representative point, an infrared camera can be helpful.
- 255 The temperature rise that occurs at each point shall then be noted. This measurement may be
- 256 done in an open test chamber (e.g. with an opened door or a lifted test space enclosure, if
- 257 applicable) or outside of the test chamber to prevent an improper temperature rise of the
- 258 surrounding air.
- 259 260 NOTE 2 The operation of a heat-dissipating specimen in a closed and switched-off test chamber leads to a
- temperature rise within the test space. In a small test chamber or with a large heat load, the temperature rise can
- 261 influence the measurement result.
- 262 NOTE 3 The temperature $T_{\mbox{\scriptsize Ca}}$ is the temperature in the vicinity of the specimen during the measurement without
- 263 264 forced convection. It can be the temperature in the test chamber or the temperature of the laboratory air, depending
- on where the test was done.
- 265 The specimen is then introduced into the test chamber, if applicable, and the test chamber is
- 266 switched on. The temperature is set to the previously recorded temperature T_{Ca} .