

TECHNICAL SPECIFICATION

**Classification of environmental conditions –
Part 4-3: Guidance for the correlation and transformation of environmental
condition classes of IEC 60721-3 to the environmental tests of IEC 60068 –
Stationary use at weatherprotected locations**

IEC TS 60721-4-3:2023

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CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	6
4 General	7
4.1 General remarks concerning IEC 60721-3-3.....	7
4.2 General remarks concerning the IEC 60068-2 series	7
4.3 Recommended test procedures and severities	7
4.4 Environmental tests for in-use classes	7
4.5 Test durations.....	8
4.6 Ambient	8
5 Climate conditions, classes 3K20 to 3K24 from IEC 60721-3-3.....	8
5.1 Class 3K20 (fully air-conditioned enclosed locations).....	8
5.2 Class 3K21 (continuously temperature-controlled enclosed locations).....	8
5.3 Class 3K22 (temperature-controlled enclosed locations).....	10
5.4 Class 3K23 (enclosed locations having no temperature or humidity control).....	12
5.5 Class 3K24 (enclosed locations having neither temperature nor humidity control)	14
6 Special climate conditions, classes 3Z12 to 3Z14 from IEC 60721-3-3.....	16
7 Biological conditions, classes 3B1 to 3B3 from IEC 60721-3-3.....	16
8 Mechanical conditions, classes 3M10 to 3M12 from IEC 60721-3-3	17
Annex A (informative) Interdependence of air temperature, relative air humidity, and absolute air humidity.....	18
Bibliography.....	19
Figure A.1 – Climatogram of interdependence of air temperature, relative air humidity, and absolute air humidity	18
Table 1 – Class 3K21 (continuously temperature-controlled enclosed locations).....	8
Table 2 – Class 3K22 (temperature-controlled enclosed locations)	10
Table 3 – Class 3K23 (enclosed locations having no temperature or humidity control).....	12
Table 4 – Class 3K24 (enclosed locations having neither temperature nor humidity control).....	14
Table 5 – Class 3Z12 to 3Z14	16
Table 6 – Class 3B1 to 3B3	16
Table 7 – Class 3M10 to 3M12.....	17

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FOREWORD

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IEC TS 60721-4-3 has been prepared by IEC technical committee 104: Environmental conditions, classification, and methods of test. It is a Technical Specification.

This first edition cancels and replaces IEC TR 60721-4-3:2001 and IEC TR 60721-4-3:2001/AMD1:2003. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC TR 60721-4-3:2001 and IEC TR 60721-4-3:2001/AMD1:2003:

- a) the document has been totally reworked;
- b) all figures have been removed, except in Annex A;

c) severities have been aligned with those of IEC 60721-3-3:2019.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
104/977/DTS	104/1014/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60721 series, published under the general title *Classification of environmental conditions*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

It is essential to emphasize the guidance nature of this document since it is virtually impossible to specify mandatory requirements for worldwide use. However, for those cases which require different tests from those recommended in this document, the guidance given should establish principles and methodology to determine alternative tests.

The reasons for correlation are provided to enable specification writers to modify a test if their application warrants it.

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CLASSIFICATION OF ENVIRONMENTAL CONDITIONS –

Part 4-3: Guidance for the correlation and transformation of environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068 – Stationary use at weatherprotected locations

1 Scope

This part of IEC 60721 deals with the correlation and transformation of the conditions given in IEC 60721-3-3 to the environmental test procedures defined in IEC 60068-2.

This document provides test procedures and test severities for electrotechnical equipment operated at stationary weatherprotected locations for the product classes set out in IEC 60721-3-3.

An environment can consist of several environmental conditions such as dynamic, climatic, and biological, and other effects due to chemically and mechanically active substances. In this document, dynamic, air pressure, biological and climatic conditions have been considered.

The purpose of this document is to provide the specification writer with guidance together with a set of easy-to-use tables which correlate and transform these environmental conditions.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60721-1, *Classification of environmental conditions – Part 1: Environmental parameters and their severities*

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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given IEC 60721-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

enclosed location

location at which a product is protected from direct exposure to meteorological conditions

4 General

4.1 General remarks concerning IEC 60721-3-3

IEC 60721-3-3 provides classes of groups of environmental parameters with their associated environmental conditions to which the products can be exposed during use. For more information of the classes used in this document, IEC 60721-3-3 shall be used.

Parameters in these classes are given individually, but the product can be exposed to conditions simultaneously. Some of the parameters are independent whilst others can be strongly correlated, for example, solar radiation and temperature.

4.2 General remarks concerning the IEC 60068-2 series

The IEC 60068-2 series provides a series of environmental test procedures. Each test procedure can contain a list of several recommended test severities.

Selection of test severities depends upon the failure consequences of the product. Two different types of products can be placed at a location covered by the same environmental class. However, one of the products can be tested under significantly more severe conditions than the other, because of the different failure consequences of the products. This document only addresses normal failure consequences; for more critical failure consequences, it can be necessary for the test severity to be increased on the basis of specialist knowledge of the product.

4.3 Recommended test procedures and severities

Table 1, Table 2, Table 3, Table 4, Table 5, Table 6 and Table 7 provided within this document set out recommended test procedures and severities, related to classes of groups of environmental parameters provided within IEC 60721-3-3. These test procedures and severities are those considered to be suitable for testing most electrotechnical products.

IEC 60721-3-3 specifies severities which have a low probability of being exceeded within that environmental class. The suggested test severities given in Table 1 to Table 7 of this document take this into account. For further information, refer to IEC TR 60721-4-0, which serves as an introduction to the IEC TR 60721-4 series.

The value for the recommended test duration or number of applications provided in Table 1 to Table 7 are selected on the basis that experience has shown them to be sufficient to demonstrate the effect of the condition on most products. It is possible that the durations recommended will not be suitable if the purpose of the test is to establish the durability, safety or life of an equipment or to quantify reliability. The combination of severity and applied test duration can also be unsuitable if the purpose of the test is to improve reliability.

4.4 Environmental tests for in-use classes

The in-use classes specify environmental conditions to which the product is exposed whilst being used, including assembly, non-operational state, maintenance, and repair. Environmental conditions created by co-located equipment within an enclosure are not included in this class. The relevant specification should detail when, during the environmental test programme, the product is in its operational state and which performance requirements should be measured before, during and after the test, together with the failure criteria.

It is important for the product specification, when referring to a certain class in the IEC 60721-3 series, to define whether the product is required to be capable of operating or only to survive without permanent damage when being exposed to the conditions described by the class.

4.5 Test durations

The durations recommended in Table 1 to Table 7 are selected on the basis that experience has shown them to be sufficient to demonstrate the effect of the condition on most products. It is possible that the durations recommended will not be suitable if the purpose of the test is to establish the durability or life of an equipment or to quantify reliability. The combination of severity and applied test duration can also be unsuitable if the purpose of the test is to improve reliability.

4.6 Ambient

The term "ambient" which is used for some recommended tests refers to the standard atmospheric conditions for measurements and tests specified in IEC 60068-1, which shall be used. The temperature shall be between 15 °C and 35 °C and relative humidity shall be between 25 % and 75 % RH with a maximum absolute humidity of 22 g/m³ and at air pressure between 86 kPa and 106 kPa.

5 Climate conditions, classes 3K20 to 3K24 from IEC 60721-3-3

5.1 Class 3K20 (fully air-conditioned enclosed locations)

No tests are recommended for class 3K20 as the severities are within standard atmosphere conditions as defined in IEC 60068-1 and are therefore considered benign for most products.

5.2 Class 3K21 (continuously temperature-controlled enclosed locations)

**Table 1 – Class 3K21
(continuously temperature-controlled enclosed locations)**

Class	Environmental parameter	Environmental severity	Recommended test procedure	Recommended test severity	Recommended test duration and number of applications	Note	
3K21	Low air temperature	+15 °C	IEC 60068-2-1, Test Ab/Ae: Cold	No	No	^a	
	High air temperature	+32 °C	IEC 60068-2-2: Dry heat, test Bb/Be	+32 °C	16 h	^b	
	Low relative humidity	10 %	IEC 60068-2-78, Test Cab: Damp heat steady state	No	No	^c	
	High relative humidity	75 %					
	Low absolute humidity	2 g/m ³					
	High absolute humidity	22 g/m ³					
	Rate of change of temperature	0,5 K/min	IEC 60068-2-14, Test Nb: Change of temperature	0,5 K/min +15 °C to +32 °C	2 cycles $t_1 = 3$ h	^d	
	Low air pressure	70 kPa	IEC 60068-2-13, Test M: Low air pressure	70 kPa	30 min	^e	
	High air pressure	106 kPa	IEC 60068-2-13, Test M: Low air pressure	No	No	^f	
	Solar radiation	500 W/m ²	No suitable IEC test procedure exists	None	None	^g	
	Heat radiation	See ^h	-	-	-	ⁱ	
Movement of surrounding air	1,0 m/s	No suitable IEC test procedure exists	None	None	^j		

	Condensation	No	No	No	No	
	Water from sources other than rain	No	No	No	No	
	Formation of ice and frost (including freeze-thaw)	No	No	No	No	
a	The low temperature conditions are within the standard atmospheric conditions described in IEC 60068-1, and so no test is recommended.					
b	The choice of the duration of 16 h is sufficient for most products to demonstrate that its design is adequately tolerated to function at this temperature.					
c	The high humidity conditions are within the standard atmospheric conditions described in IEC 60068-1, and so no test is recommended. For the interdependence of air temperature, relative air humidity and absolute air humidity see Annex A.					
d	Only recommended for products that are sensitive to temperature change. In other cases, no test is recommended as the severities are within the standard atmospheric conditions described in IEC 60068-1.					
e	Test normally not required as this air pressure is covered by standard atmospheric conditions according to IEC 60068-1. For sealed products or for products containing liquids, test M is recommended or if a special value is required, see Clause 6.					
f	Test normally not required as this air pressure is covered by standard atmospheric conditions according to IEC 60068-1. If a special value is required, see Clause 6.					
g	As this condition is secondary effects of the solar radiation through e.g. a window, no test is recommended. The heating effect is normally included in the high air temperature severity. For products mounted near e.g. a window, special precautions such as heat shields or insulation can be necessary, or an additional elevated temperature test can be required.					
h	User selection from classes 3Z1, 3Z2, 3Z3.					
i	No test is recommended. No value is available in IEC 60721-3-3 for heat radiation and the effect is normally included in the dry heat test. For products mounted near sources of high heat radiation, special precautions such as heat shields or insulation can be necessary or an additional elevated temperature test can be required, the degree of elevation being dependent on the severity of the heat source.					
j	No test is recommended. No suitable test exists in the IEC 60068-2 series, and the condition is considered as benign for most products. Precautions should be taken, especially for large products, and it is possible that the users will have to develop their own methodology if the condition is to be evaluated.					

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