

Classification of environmental conditions —

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

ICS 19.040; 19.080

National foreword

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Classification des conditions d'environnement –

Partie 4-4:

**Guide pour la corrélation et la transformation
des classes de conditions d'environnement
de la CEI 60721-3 en essais d'environnement
de la CEI 60068 –**

**Utilisation à poste fixe, non protégé contre
les intempéries**

Classification of environmental conditions –

Part 4-4:

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



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CLASSIFICATION OF ENVIRONMENTAL CONDITIONS –

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

FOREWORD

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IEC 60721-4-4, which is a technical report, has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

This consolidated version of IEC 60721-4-4 is based on the first edition (2001) [documents 104/60/CDV and 104/110/RVC] and its amendment 1 (2003) [documents 104/197/DTR and 104/258A/RVC].

It bears the edition number 1.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

The committee has decided that the contents of the base publication and its amendment 1 will remain unchanged until 2006. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

This document which is purely informative is not to be regarded as an International Standard.

INTRODUCTION

It is essential to emphasise the guidance nature of this report 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 report, the guidance given should establish principles and methodology to determine alternative tests.

Transformation guidance is provided where the parameters used to define conditions in IEC 60721-3-4 are different from those used to define the tests and/or the severities in IEC 60068-2.

The reasons for correlation are provided to enable specification writers to modify a test if their application warrants it. Where differences in values of parameters exist between IEC 60721-3-4 and IEC 60068-2, the nearest severities of the IEC 60068-2 test procedures are used. If it is necessary to deviate from an IEC 60068-2 severity, the reasons are detailed in the report and an alternative test is recommended in the tables.

CLASSIFICATION OF ENVIRONMENTAL CONDITIONS –

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

1 Scope and object

This part of IEC 60721 is a technical report dealing with the correlation and transformation of the conditions given in IEC 60721-3-4 to the environmental tests defined in IEC 60068-2.

An environment may consist of a number of environmental conditions such as dynamic, climatic and biological and other effects due to chemically and mechanically active substances. In this report, only dynamic and climatic conditions have been considered.

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

2 Reference documents

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1:1990, *Environmental testing – Part 2: Tests – Tests A: Cold*

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests – Tests B: Dry heat*

IEC 60068-2-5:1975, *Environmental testing – Part 2: Tests – Test Sa: Simulated solar radiation at ground level*

IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-13:1983, *Environmental testing – Part 2: Tests – Test M: Low air pressure*

IEC 60068-2-14:1984, *Environmental testing – Part 2: Tests – Test N: Change of temperature*

IEC 60068-2-18:1989, *Environmental testing – Part 2: Tests – Test R and guidance: Water*

IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*

IEC 60068-2-29:1987, *Environmental testing – Part 2: Tests – Test Eb and guidance: Bump*

IEC 60068-2-30:1980, *Environmental testing – Part 2: Tests – Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)*

IEC 60068-2-56:1988, *Environmental testing – Part 2: Tests – Test Cb: Damp heat, steady state, primarily for equipment*

IEC 60721-2-3:1987, *Classification of environmental conditions – Part 2: Environmental conditions appearing in nature – Air pressure*

IEC 60721-2-4:1987, *Classification of environmental conditions – Part 2: Environmental conditions appearing in nature – Solar radiation and temperature*

IEC 60721-3-4:1995, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 4: Stationary use at non-weatherprotected locations*

IEC 60721-4-0, *Classification of environmental conditions – Part 4-0: Guidance for the correlation and transformation of the environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068 – Introduction¹⁾*

ISO 554:1976, *Standard atmospheres for conditioning and/or testing – Specifications*

ISO 2533:1975, *Standard atmosphere – Addendum 1 (1985), Addendum 2 (1997)*

3 Overview

3.1 General remarks concerning IEC 60721

IEC 60721-3-4 establishes classes of groups of environmental parameters with their associated environmental conditions to which products may be exposed whilst in use in non-weather-protected locations. Parameters in these classes are given individually, but the products may be exposed to them simultaneously. Some of the parameters are independent whilst others may be strongly correlated, for example, solar radiation and temperature.

3.2 General remarks concerning IEC 60068

IEC 60068-2 establishes a series of environmental test procedures and appropriate test severities. Selection of test severities depends upon the failure consequences of the product. Two types of product may be placed at locations covered by the same environmental class. However, one type of product may be tested under significantly more severe conditions than the other because of its different failure consequences. This report only addresses normal failure consequences; for higher failure consequences, the test severity may need to be increased on the basis of specialist knowledge of the product.

3.3 Severities

IEC 60721-3-4 establishes classes of environmental conditions having a low probability of being exceeded, which cover the extreme short-term conditions to which products may be exposed. The suggested test severities given in the tables of this report take this into account. For further information, refer to IEC 60721-4-0, which serves as an introduction to the IEC 60721-4 series.

¹⁾ To be published.

3.4 Recommended tests

In the following tables two types of test are shown. The first details the equivalent IEC 60068-2 test using the nearest recommended severities. The second is the recommended test method and severities which are considered to be more suitable for testing most electrotechnical products.

3.5 Environmental tests for in-use classes

The in-use classes specify environmental conditions to which a product is exposed whilst being used, including assembly, non-operational state, maintenance and repair. Environmental conditions created by co-located product 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.

3.6 Test durations

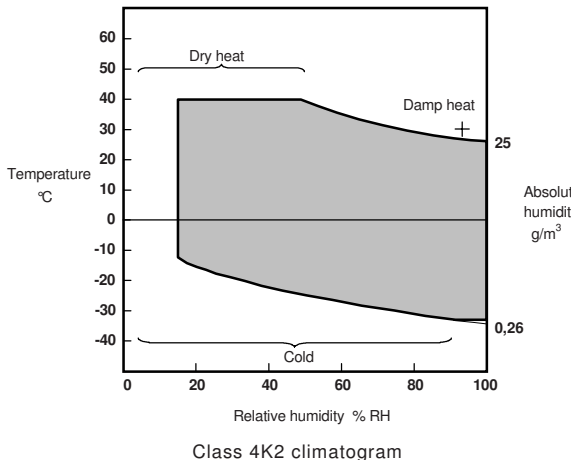
The durations recommended in tables 1 to 8 are selected on the basis that experience has shown them to be sufficient to demonstrate the effect of the condition on most products. However, the user may change these values if experience of a specific application warrants it. To assist the user, the notes associated with the tables in this report explain why the recommended duration was chosen.

3.7 Ambient

The term "ambient" which is used for some recommended tests refers to the standard atmospheric conditions described in 5.3.1 of IEC 60068-1, that is, between 15 °C and 35 °C and from 25 % to 75 % RH with a maximum absolute humidity of 22 g/m³ and at air pressure between 86 kPa and 106 kPa. Details of the standard atmospheric conditions are provided in ISO 2533 and its addenda, whilst a summary is provided in IEC 60721-2-3. A reference condition for testing is described in ISO 554.

4 Climatic conditions

Table 1 – Recommended tests for IEC 60721-3-4 – Class 4K2
(non-weatherprotected locations, moderate group of open-air climates)

IEC 60721-3-4 – Climatic conditions		IEC 60068-2 – Climatic tests				
Environmental parameter	Class 4K2	Nearest IEC 60068-2		Recommended test		Note No.
		Test method	Severity	Test method	Severity	
 Class 4K2 climatogram				x) Dry heat 60068-2-2: Bb/Bd y) Cold 60068-2-1: Ab/Ad z) Damp heat 60068-2-56: Cb	+40 °C, 16 h –40 °C, 16 h +30 °C, 93 % RH, 96 h	1), 2) 1), 3) 1), 4)
a) Low air temperature	–33 °C	As recommended test		See above		
b) High air temperature	+40 °C	As recommended test		See above		
c) Low relative humidity	15 %	As recommended test		See above		
d) High relative humidity	100 %	As recommended test		See above		
e) Low absolute humidity	0,26 g/m³	As recommended test		See above		
f) High absolute humidity	25 g/m³	As recommended test		See above		
g) Rain intensity	6 mm/min	60068-2-18: Ra Method 1	Intensity: 400 mm/h duration: 10 min minimum	60068-2-18: Rb Method 2.2	Exposure: 1 min/m² Duration: 5 min minimum	5)
h) Rate of change of temperature	0,5 °C/min	60068-2-14: Nb	–40 °C to ambient 1 °C/min	60068-2-14: Nb	–33 °C to ambient two cycles 1 °C/min $t_1 = 3 \text{ h}$	6)
i) Low air pressure	70 kPa	60068-2-13: M	70 kPa, 30 min	Test normally not required – See note 7)		7)
j) High air pressure	106 kPa	No IEC 60068-2 test		Test normally not required – See note 8)		8)
k) Solar radiation	1 120 W/m²	60068-2-5: Sa Procedure C	1 120 W/m², 72 h, 40 °C	Add 15 °C to the dry-heat test and evaluate materials for photochemical reactions		9)
Heat radiation User selection from 4Z1 or 4Z2		No IEC 60068-2 test		Test normally not required – See note 10)		10)

m) Movement of surrounding air User selection from 4Z3, 4Z4 or 4Z5		No IEC 60068-2 test	Test normally not required – See note 11)	11)
n) Condensation	Yes	No IEC 60068-2 test	60068-2-30: Db Variant 2	40 °C, 90 % to 100 % RH Two cycles
o) Precipitations: (rain, snow, hail, etc.)	Yes	No IEC 60068-2 test	Test normally not required – See note 13)	13)
p) Low rain temperature	+5 °C	No IEC 60068-2 test	Test normally not required – See note 14)	14)
q) Water from sources other than rain User selection from 4Z6, 4Z7, 4Z8 or 4Z9		No IEC 60068-2 test	See note 15)	15)
r) Formation of ice and frost	Yes	No IEC 60068-2 test	Test normally not required – See note 16)	16)

Explanatory notes for table 1 – Class 4K2

- 1) For testing products against the conditions of the climatogram, only three tests are normally used;
 - dry-heat test, where the relative humidity shall not exceed 50 % but is not specifically controlled;
 - cold test, where humidity is not controlled;
 - damp heat test, steady state, where both temperature and humidity are controlled.

These are shown as tests x, y and z in the climatogram. Other boundary conditions of the climatogram are not required to be tested and there are no IEC 60068-2 tests available.

- 2) The test temperature is equivalent to the environmental parameter of IEC 60721-3-4 for this class. The choice of the duration of 16 h is considered to be sufficient for most heat-dissipating specimens to demonstrate that their design is adequately tolerated to function at this temperature.
- 3) The test temperature is the nearest preferred value in IEC 60068-2. The effects of heat irradiation should also be taken into account (see note 9)). The choice of the duration of 16 h is considered to be sufficient for most heat-dissipating specimens to demonstrate that their design is adequately tolerated to function at this temperature.
- 4) These severities are the nearest preferred values in IEC 60068-2 and the minor changes in both temperature and humidity are considered to be insignificant and are within normal measurement tolerances. The duration of 96 h is considered to be sufficient for most heat-dissipating specimens to demonstrate that their design is adequately tolerated to function at this humidity.
- 5) IEC 60068-2-18 recommends test Ra 1 for products exposed to rain. However, this does not correspond to the rain intensity of this IEC 60721 class and is not practicable for large items. Test Rb 2.2 is therefore recommended since it is a simple, repeatable test, which can be performed on products of all sizes.

- 6) The change-of-temperature test is normally used to check design tolerancing and the range is not important. However, in this class, condensation may occur so a range is proposed which crosses the 0 °C boundary in order to allow condensation to occur for low heat-dissipating products. The specified IEC 60721 value of rate of change is 0,5 °C/min; however, the lowest preferred value in test N of IEC 60068-2-14 is 1 °C/min. It is recommended that the test value of 0,5 °C/min is used, especially for large, heat-producing products.

- 7) For sealed products or for products containing or processing liquids, test IEC 60068-2-13 M is recommended. For normal applications where the effect of air pressure is evaluated at the component level, no test is recommended.

- 8) No test is recommended. There is no IEC 60068-2 test method for this condition, which is considered benign for most products.

- 9) The IEC 60068-2-5 procedure C test for simulating the effects of solar radiation at ground level has been chosen since it produces continuous irradiation thus allowing photo-degradation effects to be assessed. The severity of this class is 1 120 W/m² which corresponds to the test condition contained in IEC 60068-2-5: Sa.

Solar tests are not considered satisfactory, since it is difficult to replicate the actual radiation experienced in practice. It is recommended that this condition should be evaluated by increasing the temperature of the dry heat test by 15 °C and evaluating materials and components for photochemical reactions. For more information, refer to IEC 60721-4-0.

With this level of solar radiation, surface temperatures may be as high as 25 °C above ambient; surface temperature can also fall at night due to heat irradiation (see IEC 60721-2-4). These effects should be taken into account when selecting materials and a reduced temperature test should be considered for the low temperature test (test Ab/Ad).

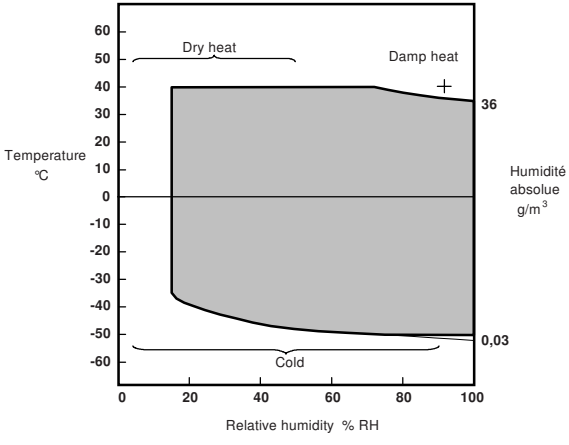
Products may be protected against the effect of solar radiation, for example, by the fitting of efficient heat shields, in which case the elevated temperature for the dry-heat test can be omitted or reduced in severity depending on the effectiveness of the precautions. It should be normal practice to model such precautions in order to give confidence in the ability of the product to resist the effect of solar radiation.

Explanatory notes for table 1 – Class 4K2 *(continued)*

- 10) No value is available in IEC 60721-3-4 for heat radiation, and therefore no additional test is recommended as 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 may be necessary or an additional elevated temperature test may be required, the degree of elevation being dependant on the severity of the heat source.
- 11) IEC 60721-3-4 describes three severities (table 2, 4Z3, 4Z4 and 4Z5) which correspond to wind velocities exerting on the product:
- 4Z3: wind velocity 20 m/s;
 - 4Z4: wind velocity 30 m/s;
 - 4Z5: wind velocity 50 m/s.
- No suitable test exists in IEC 60068-2; however, special precautions should be taken, especially for large products and the user may have to develop his own methodology if the condition is to be evaluated.
- 12) The test temperature does not correspond to the high absolute humidity characteristic severity as it is the highest preferred value in IEC 60068-2. The duration of two cycles (48 h) is considered adequate for most products. For products with high heat dissipation, omit this test since the self-heating effect will prevent condensation from occurring and the effect of high humidity is covered by test Cb (test z). Variant 2 of test Db is chosen since it adequately tests the condition and is simpler to perform than variant 1.
- 13) No test is recommended as no value is available in IEC 60721-3-4 for precipitation. The effect of rain is included in the rain test (see table line g)). The effects of hail and snow should be evaluated when selecting materials and taken into account when designing products to be used in this class.

- 14) No test is recommended as no suitable IEC 60068-2 test exists. The water tests shall be performed using fresh tap water, according to IEC 60068-2-18, and therefore the temperature is not controlled.
- 15) If suitable data exists, the user is encouraged to select a condition from 4Z6, 4Z7, 4Z8 or 4Z9. The user will then have to select the appropriate test together with the duration and test severity from IEC 60068-2-18. As a guide, the following may assist the user in the selection of a suitable test:
- a) Dripping water: If the product is normally protected from rain, but is likely to be exposed to falling drops from condensation or leakage from upper surfaces, IEC 60068-2-18: Ra 2 – drip box with a 2 m drop height, a tilt angle of 0°, and a 1 h duration is the preferred method.
 - b) Spraying water: If the product is likely to be exposed to water spray from wheels, IEC 60068-2-18 tests Rb 2.1 – oscillating tube – or Rb 2.2 – hand-held shower – 1 min/m², 30 min maximum are the preferred methods.
 - c) Splashing water: If the product is likely to be exposed to flushing or sluicing water, IEC 60068-2-18: Rb 3 – hosing, is the preferred method.
 - d) Water jets: if jets of water are likely to strike the product, choose from either IEC 60068-2-18: Ra or Rb test to demonstrate that the product is designed to function under these conditions.
- 16) No suitable test exists in IEC 60068-2 other than the cold test (test Ab/Ad); however, this condition should be considered when designing products for this class and, in particular, special precautions should be taken when the product contains moving parts.

Table 2 – Recommended tests for IEC 60721-3-4 – Class 4K3
 (non-weatherprotected locations, general group of open-air climates)

IEC 60721-3-4 – Climatic conditions		IEC 60068-2 – Climatic tests				
Environmental parameter	Class 4K3	Nearest IEC 60068-2		Recommended test		Note No.
		Test method	Severity	Test method	Severity	
 Class 4K3 climatogram				x) Dry heat 60068-2-2: Bb/Bd y) Cold 60068-2-1: Ab/Ad z) Damp heat 60068-2-56: Cb	+40 °C, 16 h –55 °C, 16 h +40 °C, 93 % RH, 10 days	1), 2) 1), 3) 1), 4)
a) Low air temperature	–50 °C	As recommended test		See above		
b) High air temperature	+40 °C	As recommended test		See above		
c) Low relative humidity	15 %	As recommended test		See above		
d) High relative humidity	100 %	As recommended test		See above		
e) Low absolute humidity	0,03 g/m³	As recommended test		See above		
f) High absolute humidity	36 g/m³	As recommended test		See above		
g) Rain intensity	15 mm/min	As recommended test		60068-2-18: Rb Method 2.2	Exposure: 3 min/m² Duration: 15 min minimum	5)
h) Rate of change of temperature	0,5 °C/min	As recommended test		60068-2-14: Nb	–50 °C to ambient two cycles 1 °C/min <i>t</i> ₁ = 3 h	6)
i) Low air pressure	70 kPa	60068-2-13: M:	70 kPa, 30 min	Test normally not required – See note 7)		7)
j) High air pressure	106 kPa	No IEC 60068-2 test		Test normally not required – See note 8)		8)
k) Solar radiation	1 120 W/m²	60068-2-5: Sa Procedure C	1 120 W/m², 72 h, 40 °C	Add 15 °C to the dry-heat test and evaluate materials for photochemical reactions		9)
Heat radiation User selection from 4Z1 or 4Z2		No IEC 60068-2 test		Test normally not required – See note 10)		10)
Movement of surrounding air 1 m/s or user selection from 4Z3, 4Z4 or 4Z5		No IEC 60068-2 test		Test normally not required – See note 11)		11)
Condensation	Yes	No IEC 60068-2 test		60068-2-30: Db Variant 2	40 °C, 90 % to 100 % RH Two cycles	12)

o) Precipitation (rain, snow, hail, etc.)	Yes	No IEC 60068-2 test	Test normally not required – See note 13)	13)
p) Low rain temperature	+5 °C	No IEC 60068-2 test	Test normally not required – See note 14)	14)
q) Water from sources other than rain User selection 4Z6, 4Z7, 4Z8 or 4Z9		No IEC 60068-2 test	See note 15)	15)
r) Formation of ice	Yes	No IEC 60068-2 test	Test normally not required – See note 16)	16)

Explanatory notes for table 2 – Class 4K3

- 1) For testing products against the conditions of the climatology, only three tests are normally used:
 - dry-heat test, where the relative humidity shall not exceed 50 % but is not specifically controlled;
 - cold test, where humidity is not controlled;
 - damp heat test, steady state, where both temperature and humidity are controlled.

These are shown as tests x, y and z in the climatology. Other boundary conditions of the climatology are not required to be tested and there are no IEC 60068-2 tests available.

- 2) The test temperature is equivalent to the environmental parameter of IEC 60721-3-4 for this class. The choice of the duration of 16 h is considered to be sufficient for most heat-dissipating specimens to demonstrate that their design is adequately tolerated to function at this temperature.
- 3) The test temperature is the nearest preferred value in IEC 60068-2. It is recommended that the test value of –50 °C is used, according to the environmental parameter of IEC 60721-3-4 for this class; however, the effects of solar irradiation should also be taken into account (see note 9)). The choice of the duration of 16 h is considered to be sufficient for most heat-dissipating specimens to demonstrate that their design is adequately tolerated to function at this temperature.
- 4) These severities are the nearest preferred values in IEC 60068-2, and the minor changes in both temperature and humidity are considered to be insignificant and are within normal measurement tolerances. The duration of 10 days is considered to be sufficient for most heat-dissipating specimens to demonstrate that their design is adequately tolerated to function at this humidity.
- 5) IEC 60068-2-18 recommends test Ra1 for products exposed to rain. However, this does not correspond to the rain intensity of this IEC 60721 class and is not practicable for large items. Test Rb 2.2 is therefore recommended since it is a simple, repeatable test, which can be performed on products of all sizes.
- 6) The change of temperature test is normally used to check design tolerancing and the range is not important. However, in this class, condensation may occur so a range is proposed which crosses the 0 °C boundary in order to allow condensation to occur for low heat-dissipating products. The specified IEC 60721 value of rate of change is 0,5 °C/min; however, the lowest preferred value in IEC 60068-2-14 is 1 °C/min. It is recommended that the test value of 0,5 °C/min is used, especially for large, heat-producing products.

- 7) For sealed products, or for products containing or processing liquids, test M of IEC 60068-2-13 is recommended. For normal applications where the effect of air pressure is evaluated at the component level, no test is recommended.

- 8) No test is recommended. There is no IEC 60068-2 test method for this condition, which is considered benign for most products.

- 9) The IEC 60068-2-5 procedure C test for simulating the effects of solar radiation at ground level has been chosen since it produces continuous irradiation thus allowing photodegradation effects to be assessed. The severity of this class is 1 120 W/m² which corresponds to the test condition contained in IEC 60068-2-5: Sa.

Solar tests are not considered satisfactory, since it is difficult to replicate the actual radiation experienced in practice. It is recommended that this condition should be evaluated by increasing the temperature of the dry-heat test by 15 °C and evaluating materials and components for photochemical reactions. For more information, refer to IEC 60721-4-0.

With this level of solar radiation, surface temperatures may be as high as 25 °C above ambient; surface temperature can also fall at night due to heat irradiation (see IEC 60721-2-4). These effects should be taken into account when selecting materials and a reduced temperature test should be considered for the low temperature test (test Ab/Ad).

Products may be protected against the effect of solar radiation, for example, by the fitting of efficient heat shields, in which case the elevated temperature for the dry-heat test can be omitted or reduced in severity depending on the effectiveness of the precautions. It should be normal practice to model such precautions in order to give confidence in the ability of the product to resist the effect of solar radiation.

- 10) No value is available in IEC 60721-3-4 for heat radiation, and therefore no additional test is recommended as 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 may be necessary or an additional elevated temperature test may be required, the degree of elevation being dependant on the severity of the heat source.
- 11) IEC 60721-3-4 describes three severities (table 2, 4Z3, 4Z4 and 4Z5) which correspond to wind velocities exerting on the product:
 - 4Z3: wind velocity 20 m/s;
 - 4Z4: wind velocity 30 m/s;
 - 4Z5: wind velocity 50 m/s.

No suitable test exists in IEC 60068-2; however, special precautions should be taken, especially for large products, and the user may have to develop his own methodology if the condition is to be evaluated.

Explanatory notes for table 2 – Class 4K3 *(continued)*

- 12) The test temperature does not correspond to the high absolute humidity characteristic severity as it is the highest preferred value in IEC 60068-2. The duration of two cycles (48 h) is considered adequate for most products. For products with high heat dissipation, omit this test since the self-heating effect will prevent condensation from occurring and the effect of high humidity is covered by test Cb (test z). Variant 2 of test Db is chosen since it adequately tests the condition and is simpler to perform than variant 1.
- 13) No test is recommended as no value is available in IEC 60721-3-4 for precipitation. The effect of rain is included in the rain test (see table line g)). The effects of hail and snow should be evaluated when selecting materials and taken into account when designing products to be used in this class.
- 14) No test is recommended as no suitable IEC 60068-2 test exists. The water tests shall be performed using fresh tap water, according IEC 60068-2-18, and therefore the temperature is not controlled.
- 15) If suitable data exists, the user is encouraged to select a condition from 4Z6, 4Z7, 4Z8 or 4Z9. The user will then have to select the appropriate test together with the duration and test severity from IEC 60068-2-18. As a guide, the following may assist the user in the selection of a suitable test:
 - a) Dripping water: If the product is normally protected from rain, but is likely to be exposed to falling drops from condensation or leakage from upper surfaces, IEC 60068-2-18: Ra 2 – drip box with a 2 m drop height, a tilt angle of 0°, and a 1 h duration is the preferred method.
 - b) Spraying water: If the product is likely to be exposed to water spray from wheels, IEC 60068-2-18: tests Rb 2.1 – oscillating tube – or Rb 2.2 – hand-held shower – 1 min/m², 30 min maximum are the preferred methods.
 - c) Splashing water: If the product is likely to be exposed to flushing or sluicing water, IEC 60068-2-18: Rb 3 – hosing – is the preferred method.
 - d) Water jets: if jets of water are likely to strike the product, choose from either IEC 60068-2-18: Ra or Rb test to demonstrate that the product is designed to function under these conditions.
- 16) No suitable test exists in IEC 60068-2 other than the cold test (test Ab/Ad); however, this condition should be considered when designing products for this class and, in particular, special precautions should be taken when the product contains moving parts.