Application Note 5SZK 9111-00

Storage of HiPak Environmental specification

The storage of the HiPak is classified according to IEC 60721-3-1 set IE11.

Time limitation for operation

If HiPaks are stored under conditions described in this specification and if all special supplier instructions on handling and packing are followed, shelf life shall not exceed 5 years.
The specification as described in this document is only valid for modules as produced and packed by ABB Switzerland Ltd, Semiconductors. Since the HiPaks are electrostatic sensitive devices, please observe IEC 60747-1, chap. IX, the gate-emitter terminals must be short circuited during storage. The situation has to be considered separately for units on a higher assembly integration level (e.g. modules connected with gate units, coolers etc.).

Description of class IE11

This set covers continuously temperature-controlled locations, heating, cooling or humidification being used where necessary to maintain required conditions; exposure to some solar and heat radiation; movement of surrounding air, such as through open windows; without particular risk of biological attacks, with normal levels of contaminants experienced in urban areas with industrial activities scattered over the whole area, or with heavy traffic; without special precautions to minimize presence of dust or sand, but not situated in proximity to dust and sand sources, experiencing vibration of low significance.[1]

Set of class IE11

Condition	Class
Climatic	1K2
Special climatic	1Z2
Biological	1B1
Chemically active substances	1C2
Mechanically active substances	1S2
Mechanical	1M2

Climatic conditions

This class applies to temperature controlled enclosed locations.

Environmental parameter	Class 1K2
Low air temperature	+5°C
High air temperature	+40°C
Low relative humidity	5%
High relative humidity	85%
Low absolute humidity	1 g/m^3
High absolute humidity	25 g/m^3
Rate of change of temperature	0.5°C/min
Low air pressure	70 kPa
High air pressure	106 kPa
Solar radiation	700 W/m^2
Heat radiation	Negligible
Movement of surrounding air	1 m/s
Condensation	No
Precipitation	No
Rain intensity	None
Low rain temperature	None
Water from sources other than rain	No
Formation of ice and frost	No

Humidity is not controlled. Heating and cooling is used to maintain the required conditions, especially where there is a large difference between them and the open-air climate. Stored products may be exposed to movements of surrounding air due to draughts in buildings, caused by open windows, special process conditions, etc.[2]

Special climatic conditions

Environmental parameter	Class 1Z1
Heat radiation	negligible

Biological conditions

This class applies to locations without particular risks of biological attacks. This includes protective measures, such as special product design, or storage in locations of such constructions that mould growth, attacks by animals, etc. are not probable.[3]

Environmental parameter	Class 1B1
Flora	negligible
Fauna	negligible

Chemical conditions

This class applies to locations with normal levels of contaminants as experienced in urban areas with industrial activity scattered over the whole area, or with heavy traffic.[4]

Environmental parameter	Class 1C2	
	Mean value	Maximum value
Sea and road salts	Salt mist	
Sulfur dioxide	0.3 mg/m^3	1.0 mg/m^3
	0.11 cm^3/m^3	0.37 cm^3/m^3
Hydrogen sulfide	0.1 mg/m^3	0.5 mg/m^3
	0.071 cm^3/m^3	0.36 cm3^3/m^3
Chlorine	0.1 mg/m^3	0.3 mg/m^3
	0.034 cm^3/m^3	0.1 cm^3/m^3
Hydrogen chloride	0.1 mg/m^3	0.5 mg/m^3
	0.066 cm^3/m^3	0.33 cm^3/m^3
Hydrogen fluoride	0.01 mg/m^3	0.03 mg/m^3
	0.012 cm^3/m^3	0.036 cm^3/m^3
Ammonia	1.0 mg/m^3	3.0 mg/m^3
	1.4 cm3/m^3	4.2 cm^3/m^3
Ozone	0.05 mg/m^3	0.1 mg/m^3
	0.025 cm^3/m^3	0.05 cm^3/m^3
Nitrogen Oxides (expressed in equivalent	0.5 mg/m^3	1.0 mg/m^3
values of nitrogen dioxide)	0.26 cm^3/m^3	0.52 cm^3/m^3

The mean values are expected long-term values. Maximum values are limit or peak values, occurring over a period of time of not more than 30 min per day.

Mechanically active substances

This class applies to locations without special precautions to minimize the presence of dust or sand, but not situated in the proximity to dust or sand sources. [5]

Environmental parameter	Class 1S2
Sand	30 mg/m^3
Dust (suspension)	0.2 mg/m^3
Dust (sedimentation)	1.5 mg/m^3

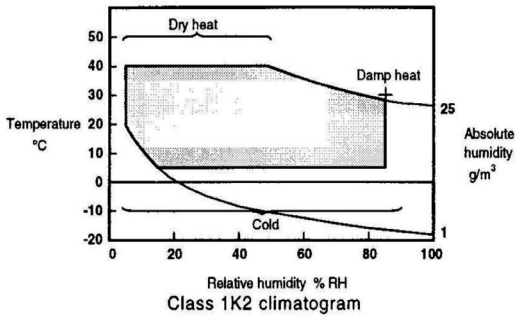
Mechanical conditions

This class applies to locations with vibration of low significance and insignificant shock.[6]

Environmental parameter	Class 1M2	
a) Stationary vibration sinusoidal		
Displacement amplitude	1.5 mm	
Acceleration amplitude		5 m/s^2
Frequency range	2-9 Hz	9-200 Hz
b) Non-stationary vibration including shock		
Shock response spectrum type L	30 m/s^2 [7]	
Peak acceleration		
Shock response spectrum type I	None	
Peak acceleration		
Shock response spectrum type II	None	
Peak acceleration		
c) Static load	2kPa [8]	

1 see IEC 60721-3-1, Annex B, page 37
2 see IEC 60721-3-1, Annex A, page 29
3 see IEC 60721-3-1, Annex A, page 31
4 see IEC 60721-3-1, Annex A, page 33
5 see IEC 60721-3-1, Annex A, page 33
6 see IEC 60721-3-1, Annex A, page 33
7 In deviation with IEC 60721-3-1
8 In deviation with IEC 60721-3-1

Tests for Class 1K2[9]

Climatic conditions		Recommended IEC 60068-2 Climatic tests		PTS tests	
Environmental parameter	Class 1K2	Test method	Severity	Test method	Severity
 Class 1K2 climatogram		Dry heat 60068-2-2	+40°C, 16 h	60068-2-2 Bb	+70°C, 16 h
		Cold 60068-2-1	+5°C, 16 h	Cold 60068-2-1	+5°C, 24 h
		Damp heat 60068-2-56	+30°C, 85% R.H., 96 h	Damp heat 60068-2-78	+40°C, 93% R.H.,
				Forced condensation JEDEC Jesd22-A100-B	Cycles between 30 °C and ±65 °C, R.H. between 90% and 98%, 3 cycles a day, 1000 hrs
Low air temperature	+5 °C	See above			
High air temperature	+40 °C	See above			
Low relative humidity	5%	See above			
High relative humidity	85%	See above			
Low absolute humidity	1 g/m^3	See above			
High absolute humidity	25 g/m^3	See above			
Rate of change of temperature	0.5 °C/min	Test normally not required			
Low air pressure	70 kPa	Test normally not required			
High air pressure	106 kPa	Test normally not required			
Solar radiation	700 W/m^2				
Heat radiation		Test normally not required			
Movement of surrounding air	1 m/s	Test normally not required			
Condensation	No				
Precipitation	No				
Rain intensity	None				
Low rain temperature	None				
Water from sources other than rain	No				
Formation of ice and frost	No				

Tests for Class 1C2

Salt mist, SO_2 and H_2S tests done according to DIN EN 60068-2-60 (report TN PTS 06-146).

Tests for Class 1S2

No tests will be done.

Tests for Class 1M2

Tests done according to: EN60068-2-36 / EN61373:1999 Cat. 1, Class B (vibration) and EN 60068-2-27:2008 / EN61373:1999 Cat. 1, Class B (shock). The vibration tests are not done with sinusoidal vibration but random (for transport applications).

Revision history

Prepared	Checked 1	Checked 2	Approved	Date
Backlund	Schnell	Duran	Schlegel	11.03.11

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9 see IEC TR 60721-4-1, page 18