Application Note 5SZK 9113-00

Operation (Industry) of HiPak Environmental specification

The operation of HiPak is classified according to IEC 60721-3-3 set IE33.

Time limitation for operation

Within the context of this specification a useful life of 20 years is assumed. The time limitation of operational life however may be dominated by the applied functional load, which is not a topic of this generic specification.

Description of class IE33

IE33 applies to locations, continuously temperature-controlled, with heating cooling or humidification used where necessary to maintain required conditions, installed products exposed to some solar radiation, without particular risk of biological attacks, with normal levels of contaminants, sand and dust experienced in urban areas with industrial activities, with vibration of low significance, such as rooms for general use, workshops.[1]

Set of class IE33

Condition	Class
Climatic	3K3
Special climatic	3Z2
	3Z4
Biological	3B1
Chemically active substances	3C2
Mechanically active substances	3S2
Mechanical	3M2

Climatic conditions

Environmental parameter	Class 3K3
Low air temperature	+5°C
High air temperature	+60°C[2]
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	
Movement of surrounding air	1 m/s
Condensation	No
Precipitation	No
Rain intensity	No
Low rain temperature	No
Water from sources other than rain	No
Formation of ice and frost	No

This class applies to temperature controlled enclosed locations. Humidity is not controlled. Installed products may be exposed to attenuated solar radiation and to movements of surrounding air due to draughts from air-conditioning system. They are not subjected to heat radiation, condensed water, precipitation, water from sources other than rain, or formation of ice. Heating or cooling is used to maintain the required conditions, especially where there is a large difference between them and the open-air climate.

The condition of this class may be found in normal living or working areas, offices, shops, workshops for electronic assemblies and other electrotechnical products, telecommunication centres, storage rooms for valuable and sensitive products.[3]

Special climatic conditions[4]

Environmental parameter	Class 3Z2, 3Z4
Heat radiation	Heat radiation, e.g. in the vicinity of room heating
Movement of surrounding air	5m/s

Biological conditions

This class applies to locations without particular risks of biological attacks. It includes protective measures, e.g. special product design, or installations in locations of such construction that mould growth, attacks of animals, etc., are not probable.[5]

Environmental parameter	Class 3B1
Flora	No
Fauna	No

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. In deviation to the standard the presence of salt mist is not allowed.[6]

Environmental parameter	Class 3C2	
	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 values of nitrogen dioxide)	0.5 mg/m^3	1.0 mg/m^3
	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.[7]

Environmental parameter	Class 3S2
Sand	30 mg/m^3
Dust (suspension) Sand	0.2 mg/m^3
Dust (sedimentation)	1.5 mg/m^{2}h

Mechanical conditions

This class applies to locations with vibration of low significance, e.g. for products fastened to light supporting structures subjected to negligible vibrations.[8]

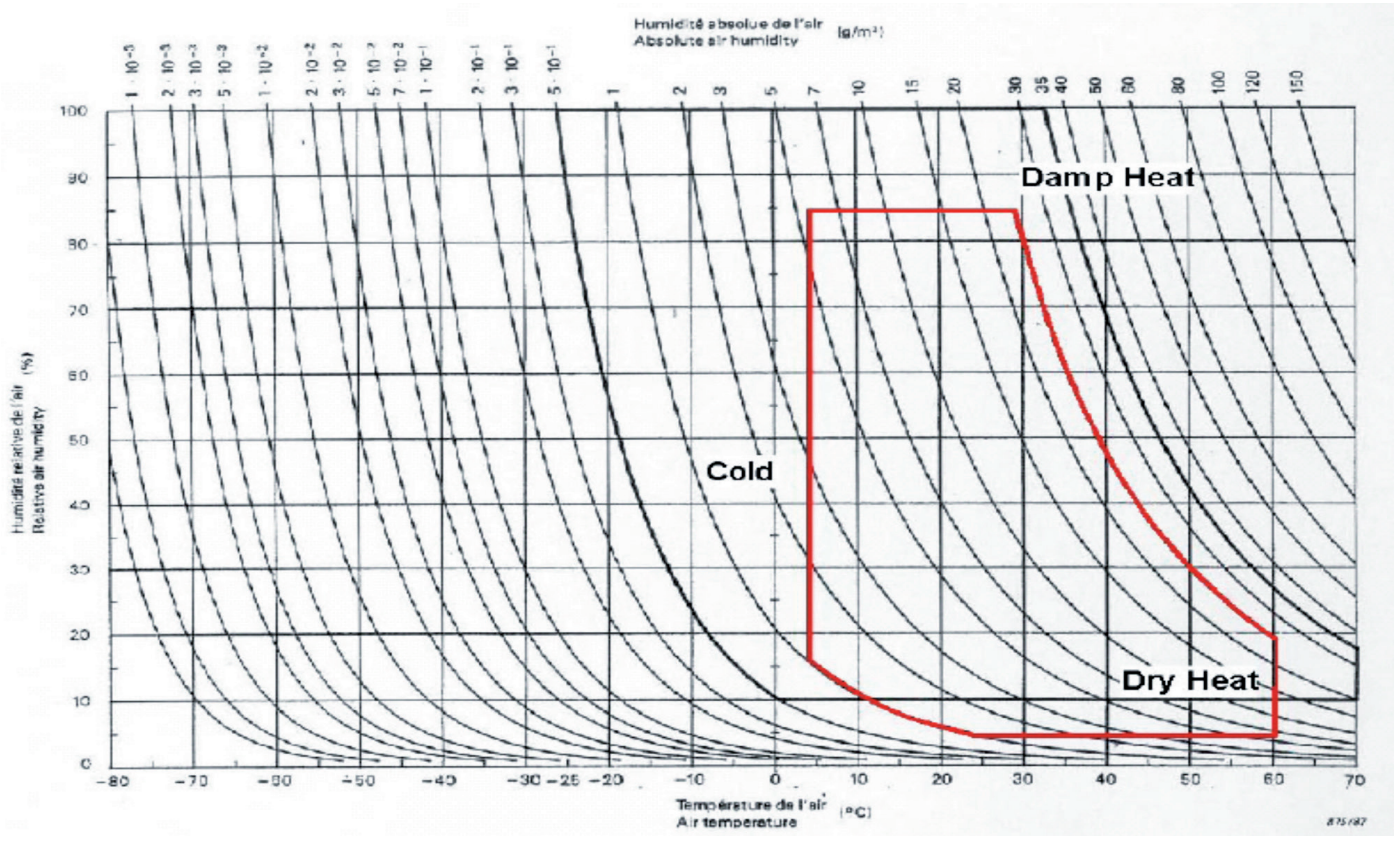
Environmental parameter	Class 3M2
Stationary vibration sinusoidal	
Displacement amplitude	1.5 mm
Acceleration amplitude	5 m/s^2
Frequency range	2-9 Hz; 9-200 Hz
Non-stationary vibration including shock	
Peak acceleration	30 m/s^2 [9]

1 see IEC 60721-3-3, Annex D, page 77
2 In deviation to the standard IEC 60721-3-3, page 22 which states +40°C
3 see IEC 60721-3-3, Annex A, page 51
4 see IEC 60721-3-3, page 21
5 see IEC 60721-3-3, Annex A, page 55
6 see IEC 60721-3-3, Annex A, page 55
7 see IEC 60721-3-3, Annex A, page 57
8 see IEC 60721-3-3, Annex A, page 57
9 In deviation with IEC 60721-3-3

Tests for Class 3K3[10]

Climatic conditions		Recommended IEC 60068-2 Climatic tests		PTS tests	
Environmental parameter	Class 3K3	Test method	Severity	Test method	Severity
For the climatogram see page 6		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., 56 d
Low air temperature	+5 °C	See above			
High air temperature	+60 °C[11]	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				

Climatogram for the Class 3K3[10]



11 In deviation to IEC 60721-3-3
12 The climatogram is changed with respect to the high air temperature of 60 °C.

Tests for Class 3C2

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

Tests for Class 3S2

No tests will be done.

Tests for Class 3M2

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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