Application Note 5SZK 9109-00

# Storage of IGCTs

The storage of hermetic pressure contact IGCTs within their transport box is classified according to IEC 60721-3-1 set IE11.

## Time limitation for storage

If hermetic pressure contact IGCTs are stored under conditions described in this specification and if all special supplier instructions on handling and packing are followed, shelf life is at least 5 years.

The specification as described in this document is only valid for devices as produced and packed by ABB Switzerland Ltd., Semiconductors.

## 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 | 1C1[2] |
| 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 | 75 %[3] |
| Low absolute humidity | 1 g/m$^3$[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.[4]

## Special climatic conditions

| Environmental parameter | Class 1Z2 |
|---|---|
| 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.[5]

| Environmental parameter | Class 1B1 |
|---|---|
| Flora | negligible |
| Fauna | negligible |

## Chemical conditions

This class applies to locations in rural and some urban areas, with low industrial activity and moderate traffic. In winter, heating methods in concentrated urban areas may cause increased contamination. Salt mist may be present in sheltered locations in coastal areas.[6]

| Environmental parameter | Class 1C1 |
|---|---|
| | Maximum value |
| Sea and road salts | No[7] |
| Sulfur dioxide | 0.1 mg/m$^3$<br>0.037 cm$^3$/m$^3$ |
| Hydrogen sulfide | 0.01 mg/m$^3$<br>0.0071 cm$^3$/m$^3$ |
| Chlorine | 0.1 mg/m$^3$<br>0.0.34 cm$^3$/m$^3$ |
| Hydrogen chloride | 0.1 mg/m$^3$<br>0.066 cm$^3$/m$^3$ |
| Hydrogen fluoride | 0.003 mg/m$^3$<br>0.0036 cm$^3$/m$^3$ |
| Ammonia | 0.3 mg/m$^3$<br>0.42 cm$^3$/m$^3$ |
| Ozone | 0.01 mg/m$^3$<br>0.005 cm$^3$/m$^3$ |
| Nitrogen oxides (expressed in equivalent values of nitrogen dioxide) | 0.1 mg/m$^3$<br>0.052 cm$^3$/m$^3$ |

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.[8]

| Environmental parameter | Class 1S2 |
|---|---|
| Sand | 30 mg/m$^3$ |
| Dust (suspension) | 0.2 mg/m$^3$ |
| Dust (sedimentation) | 1.5 mg/m$^2$ |

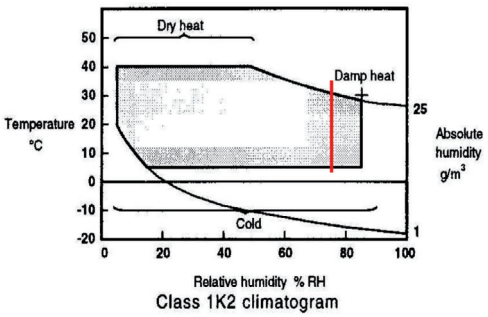
## Mechanical conditions

This class applies to locations with vibration of low significance and insignificant shock.[9]

| 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 | | |
| Peak acceleration | 40 m/s$^2$ | |
| Shock response spectrum type I | | |
| Peak acceleration | None | |
| Shock response spectrum type II | | |
| Peak acceleration | None | |
| c) Static load | 5 kPa | |

1 see IEC 60721-3-1, Annex B, page 37
2 In deviation to IEC 60721-3-1
3 In deviation to IEC 60721-3-1
4 see IEC 60721-3-1, Annex A, page 29
5 see IEC 60721-3-1, Annex A, page 31
6 see IEC 60721-3-1, Annex A, page 33
7 Salt mist may be present in sheltered locations of coastal areas, see IEC 60721-3-1, table 4, page 23
8 see IEC 60721-3-1, Annex A, page 33
9 see IEC 60721-3-1, Annex A, page 33

## Tests for Class 1K2[10]

| 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., 56 d |
| | | | | 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 | 75 % [11] | See above | | | |
| Low absolute humidity | 1 g/m³ | See above | | | |
| High absolute humidity | 25 g/m³ | 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/m² | | | | |
| 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 1C1

No tests will be done.

## Tests for Class 1S2

No tests will be done.

## Tests for Class 1M2

Not tested according to Storage class 1M2 but tested according to class 2M2 for transportation.

## Revision history

| Prepared | Checked 1 | Checked 2 | Approved | Date |
|---|---|---|---|---|
| Backlund | Setz | Stiasny | Schlegel | 01.12.09 |

10 see IEC TR 60721-4-1, page 18
11 In deviation to IEC 60721-3-1

**ABB Switzerland Ltd.**
**Semiconductors**
Fabrikstrasse 3
CH-5600 Lenzburg
Switzerland
Tel: +41 58 586 14 19
Fax: +41 58 586 13 06
E-Mail: abbsem@ch.abb.com
www.abb.com/semiconductors