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Surface mounting technology –
Part 2: Transportation and storage conditions of surface mounting devices (SMD) – Application guide

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Surface mounting technology – Part 2: Transportation and storage conditions of surface mounting devices (SMD) – Application guide

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SURFACE MOUNTING TECHNOLOGY –

Part 2: Transportation and storage conditions of surface mounting devices (SMD) – Application guide

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61760-2:2007. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61760-2 has been prepared by IEC technical committee 91: Electronics assembly technology. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
91/1666/CDV	91/1708/RVC

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 International Standard 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/standardsdev/publications.

Cross-references for references from this edition 3 to the previous edition 2 of this document are listed in Annex X of this document.

A list of all parts in the IEC 61760 series, published under the general title *Surface mounting technology*, 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
- amended.

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SURFACE MOUNTING TECHNOLOGY –

Part 2: Transportation and storage conditions of surface mounting devices (SMD) – Application guide

1 Scope ~~and object~~

This International Standard ~~describes~~ specifies the transportation and storage conditions for surface mounting devices (SMDs) that are fulfilled in order to enable trouble-free processing of surface mounting devices, both active and passive. (Conditions for printed boards are not taken into consideration.)

The object of this document is to ensure that users of SMDs receive and store products that can be further processed (e.g. positioned, soldered) without prejudice to quality and reliability. Improper transportation and storage of SMDs ~~may~~ can cause deterioration and result in assembly problems such as poor solderability, delamination and "popcorning".

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 60286-3, *Packaging of components for automatic handling – Part 3: Packaging of surface mount components on continuous tapes*~~

~~IEC 60286-4, *Packaging of components for automatic handling – Part 4: Stick magazines for electronic components encapsulated in packages of form* **E** and **G**~~

~~IEC 60286-5, *Packaging of components for automatic handling – Part 5: Matrix trays*~~

~~IEC 60286-6, *Packaging of components for automatic handling – Part 6: Bulk case packaging for surface mounting components*~~

IEC 60721-3-1:2018, *Classification of environmental conditions – Part 3-1: Classification of groups of environmental parameters and their severities –: Storage*

IEC 60721-3-2:2018, *Classification of environmental conditions – Part 3-2: Classification of groups of environmental parameters and their severities –: Transportation and handling*

~~IEC 60749 (all parts), *Semiconductor devices – Mechanical and climatic test methods*~~

~~IEC/TS 61340-5-1, *Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements*~~

~~IEC/TR 61340-5-2, *Electrostatics – Part 5-2: Protection of electronic devices from electrostatic phenomena – User guide*~~

3 Terms and definitions

ISO and IEC maintain terminological 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

No terms and definitions are listed in this document.

4 General conditions

Surface mounting devices shall be packed in such a way that products are protected during transportation and storage without loss of their properties arising from mechanical, environmental and electrical influences. Packing requirements as defined in various IEC publications, such as IEC 60286-3, IEC 60286-4, IEC 60286-5, IEC 60286-6 and IEC TR 61340-5-5 ~~may~~ can contribute to the protection of components during transportation and storage.

If dry packing is specified and used, the IEC publications IEC 61760-4, IEC 60749-20-1 and IPC/JEDEC J-STD-033 should be consulted.

Usually, transportation conditions are less controlled than storage conditions. Nevertheless, conditions shall be controlled and deviations from the advised conditions in this document should be reduced to as little time as possible.

5 Transportation conditions

5.1 General transportation conditions

During transportation, the SMDs, including their chosen style of tapes or stick magazines, etc., shall be protected against extreme temperature, humidity, and mechanical forces. Unless otherwise specified by the component supplier, the following environmental conditions shall be met:

Climatic condition are according to IEC 60721-3-2:2018, class 2K12~~, except~~ Deviations from these conditions are listed below:

– low air temperature: −40 °C;

~~– change of temperature air/air: −40 °C / +30 °C,~~

– low air pressure: 30 kPa,

– change of air pressure: 6 kPa/min; high relative humidity 75 %;

– no dripping water;

– no condensation is allowed.

The conditions are presented in tabular form in Annex A, Table A.1.

The total number of extreme temperature events (close to limits) should be limited to a minimum during transportation and storage.

Mechanical condition is according to IEC 60721-3-2:2018, class ~~2M1~~ 2M4. The condition is presented in tabular form, including a figure, in Annex A, Table A.2 and Figure A.1.

Transportation shall be managed in such a way that boxes are not deformed and forces are not directly passed on to the inner packaging.

Total transportation time shall be as short as possible, but preferably not exceeding 10 days. (Total transportation time is time when products are not within controlled storage conditions.)

5.2 Special transportation conditions

5.2.1 General

Depending on the sensitivity of the products to be transported, a choice shall be made between air transport, where conditions during flight are well controlled, or less controlled conditions, e.g. during rail or road transportation.

5.2.2 Category 1 (advised for all products)

Air transport (conditions during flights with conditioned cargo room).

Climatic conditions are according to IEC 60721-3-2:2018, class 2K11. Deviations from these conditions are listed below:

– low air temperature −40 °C;
– low relative humidity 10 %;
– high relative humidity 75 %;
– low air pressure 30 kPa.

The conditions are presented in tabular form in Annex A, Table A.1.

It should be realised that waiting time and loading operations at the airport are under less controlled conditions. These shall at least fulfil the general transportation conditions stated in 5.1.

5.2.3 Category 2

Rail, road, and unconditioned air transportation.

Only allowed for products and packaging systems that are not sensitive to the general transportation conditions stated in 5.1.

Minimum air pressure: corresponding to an altitude of < 12 km (about 19,3 kPa).

6 Storage conditions

Well controlled storage conditions are a major factor in problem prevention. Do not store in locations where the soldering properties can be deteriorated by harmful gases. Conditions that ~~may~~ can expose products to detrimental electrical field strengths should be avoided. Exposure of the products to direct solar radiation should be avoided.

The following conditions are advised:

Climatic conditions are according to IEC 60721-3-1:2018, class 1K21~~, except~~.

Deviations from these conditions are listed below:

– low relative humidity 10 %;
– high relative humidity 75 %;
– solar radiation 700 W/m^2, but direct solar radiation should be avoided.

The conditions are presented in tabular form in Annex A, Table A.3.

The storage time as given by the manufacturer specification shall not be exceeded. It is however recommended that the total storage time should not exceed two years (manufacturer and customer) but should be limited to one year after receipt of the products by the customer. In specific cases, the exact storage time and the re-qualification rules, if the time is exceeded, are given in the component specification. As a minimum, at least the solderability of the components ~~has to~~ shall be re-qualified.

If longer storage times are needed, the manufacturer should be consulted to conclude arrangements for suitable storage and packaging conditions.

During storage the original smallest packaging unit (SPU) shall not be opened, the SPU should preferably remain in the original packaging.

Even though products are stored for a shorter period of time, it is advised to apply the temperature and humidity conditions set out in this Clause 6.

For "last call" components, the storage conditions to conserve the component's properties shall be agreed between the manufacturer and the user.

7 Related issues

If the products in standard packaging do not fulfil the required quality and reliability goals under the shipment and storage conditions as described in Clause 5 and Clause 6, special actions shall be considered as described in IEC 60749 (all parts), IEC~~/TS~~ 61340-5-1 and IEC TR 61340-5-2.

Considerations for risk mitigation, packaged component long-term storage and associated traceability, can be found in IEC 62435 (all parts).

Annex A
(informative)

Transportation ~~climatic~~ and storage conditions

For easy and rapid reference, this Annex A shows the content of the quoted conditions from IEC 60721-3-1:2018 and IEC 60721-3-2:2018.

The information is presented on following pages in tabular form in Table A.1, Table A.2 and Table A.3. In each table the deviations given in this document from conditions provided in IEC 60721-3-2 and from IEC 60721-3-1 are specified, if any.

Table A.1 – Classification of climatic conditions according to IEC 60721-3-2:2018, Table 1.

Table A.2 – Classification of mechanical conditions according to IEC 60721-3-2:2018, Table 5 and Figure 2.

Table A.3 – Storage conditions according to IEC 60721-3-1:2018, Table 1.

NOTE The footnote references can be found on the last page.

Table A.1 – Transportation climatic conditions according to IEC 60721-3-2

Environmental parameter	Unit	Class		Conditions used in this standard instead of 2K2
		2K1	2K2	
a) Low air temperature	°C	+5	–25	–40
b) High air temperature, air in unventilated enclosures [1]	°C	No	+60	
c) High air temperature, air in ventilated enclosures or outdoor air [2]	°C	+40	+40	
d) Change of temperature, air/air [3]	°C	No	–25/+25	–40/+30
e) Change of temperature, air/water [3]	°C	No	No	
f) Relative humidity, not combined with rapid temperature changes	% °C	75 +30	75 +30	
g) Relative humidity, combined with rapid temperature changes: air/air at high relative humidity [3]	% °C	No	No	
h) Absolute humidity, combined with rapid temperature changes: air/air at high water content [4]	g/m³ °C	No	No	
i) Low air pressure	kPa	70	70	30
j) Change of air pressure	kPa/min	No	No	6
k) Movement of surrounding medium, air	m/s	No	No	
l) Precipitation, rain	mm/min	No	No	
m) Radiation, solar	W/m²	700	700	
n) Radiation, heat	W/m²	No	No	
o) Water from sources other than rain [5]	m/s	No	No	
p) Wetness	None	No	No	

[1] The high temperature of the surface of a product may be influenced by both the surrounding air temperature given here and the solar radiation through a window or other opening.

[2] The high temperature of the surface of a product is influenced by the surrounding air temperature given here and the solar radiation defined below.

[3] A direct transfer of the product between the two temperatures given is presumed.

[4] The product is assumed to be subject to a rapid decrease of temperature only (no rapid increase). The figures of water content apply to temperatures down to the dew point; at lower temperatures the relative humidity is assumed to be approximately 100 %.

[5] The figure indicates the velocity of water and not the height of water accumulated.

Table A.2 – Transportation mechanical conditions according to IEC 60721-3-2

Environmental parameter	Unit	Class
		2M1
a) Stationary vibration, sinusoidal [1]:		
displacement amplitude	mm	3,5
acceleration amplitude	m/s²	10
frequency range	Hz	2-9 / 9-200 / 200-500
b) Stationary vibration, random [1]		
acceleration spectral density	m²/s²	1 / 0,3
frequency range	Hz	10-200 / 200-2 000
c) Non-stationary vibration including shock [2]:		
shock response spectrum type I, peak acceleration	m/s²	100
shock response spectrum type II, peak acceleration	m/s²	No
d) Free fall:		
Mass less than 20 kg	m	0,25
Mass 20 kg to 100 kg	m	0,25
Mass more than 100 kg	m	0,1
e) Toppling:		
Mass less than 20 kg	None	Toppling around any of the edges
Mass 20 kg to 100 kg	None	No
Mass more than 100 kg	None	No
f) Rolling, pitching:		
Angle [3]	Degree	No
Period	s	No
g) Steady-state acceleration	m/s²	20
h) Static load	kPa	5

[1] The frequency range may be limited to 200 Hz for transportation on parts of the vehicle with high internal damping.

[2] See Figure 1 in IEC 60721-3-2.

[3] An angle of 35° only occurs temporarily, but angles up to 22,5° can be reached for long periods of time.

Table A.3 – Storage conditions according to IEC 60721-3-1

Environmental parameter	Unit	Class	Conditions used in this standard instead of 1K2
		1K2	
a) Low air temperature	°C	+5	
b) High air temperature	°C	+40	
c) Low relative humidity [1)]	%	5	10
d) High relative humidity [1)]	%	85	75
e) Low absolute humidity [1)]	g/m^3	1	
f) High absolute humidity [1)]	g/m^3	25	
g) Rate of change of temperature [2)]	°C/min	0,5	
h) Low air pressure [3)]	kPa	70	
i) High air pressure [3)]	kPa	106	
j) Solar radiation	W/m^2	700	[6)]
k) Heat radiation	None	[7)]	
l) Movement of surrounding air [4)]	m/s	1,0 [8)]	
m) Condensation	None	No	
n) Precipitation (rain, snow, hail, etc.)	None	No	
o) Rain intensity	Mm/min	None	
p) Low rain temperature [5)]	°C	None	
q) Water from sources other than rain	None	No	
r) Formation of ice and frost	None	No	

1) The low and high relative humidities are limited by the low and high absolute humidities, so that, for example, for environmental parameters a) and c), or b) and d), the severities given in table do not occur simultaneously.

2) Averaged over a period of time of 5 min.

3) The value of 70 kPa represents a limit for open air conditions, normally at an altitude of 3 000 m. In some geographical areas, open air conditions may occur at higher altitudes. Conditions in mines are not considered.

4) A cooling system based on non-assisted convection may be disturbed by adverse movement of surrounding air.

5) This rain temperature should be considered together with high air temperature b) and solar radiation j). The cooling effect of the rain has to be considered in connection with the surface temperature of the product.

6) Exposure of the products to direct solar radiation should be avoided.

7) Conditions occurring at the location concerned to be selected: either 1Z1 = negligible, or 1Z2 = conditions of heat radiation, e.g. in the vicinity of room heating systems.

8) If applicable, a specific value may be selected either 1Z3 = 30 m/s or 1Z4 = 50 m/s.

Table A.1 – Classification of climatic conditions according to IEC 60721-3-2:2018, Table 1

Environmental parameter	Unit	Classification			
		Weather-protected		Conditions used in this document instead of those of IEC 60721-3-2	
		2K11	2K12	2K11	2K12
a) Low air temperature	°C	+5	–45	–40	–40
b) High air temperature	°C	+40	+70	+60	+60
c) Low relative humidity [1)]	%	5	4	10	10
d) High relative humidity [1)]	%	85	100	75	75
e) Low absolute humidity [1)]	g/m^3	1	0,5		
f) High absolute humidity [1)]	g/m^3	25	29		
g) Rate of change of temperature [2)]	°C/min	0,5	1,0		
h) Low air pressure [3)]	kPa	70	70	30	30
i) High air pressure [3)]	kPa	106	106	[7)]	[7)]
j) Solar radiation	W/m^2	No	[6)]		
k) Heat radiation	Not specified	None	None		
l) Movement of surrounding air [4)]	m/s	1,0	1,0		
m) Condensation	Not specified	No	Yes		No
n) Precipitation (rain, snow, hail, etc.)	Not specified	No	No		
o) Rain intensity	mm/min	None	None		
p) Driving rain	m/s	None	None		
q) Snow load	kg/m^2	None	None		
r) Low rain temperature [5)]	°C	None	None		
s) Water from sources other than rain	Not specified	No	Dripping Water		No
t) Formation of ice and frost (including freeze-thaw)	Not specified	No	Yes		
u) Temperature shock	Not specified	No	Yes		

1) The low and high relative humidity levels are limited by the low and high absolute humidity, so that, for example, for environmental parameters a) and c), or b) and d), the severities given in Table A.1 do not occur simultaneously.

2) Averaged over a period of time of 5 min.

3) The value of 70 kPa represents a limit for open-air conditions, normally at an altitude of 3 000 m. In some geographical areas, open-air conditions can occur at higher altitudes. Conditions in mines are not considered.

4) A cooling system based on non-assisted convection can be disturbed by adverse movement of surrounding air.

5) This rain temperature should be considered together with high air temperature b) and solar radiation j). The cooling effect of the rain has to be considered in connection with the surface temperature of the product.

6) Thermal effect of solar radiation is included in the temperature.

7) Extra requirement in this document: change of air pressure 6 kPa/min.

Table A.2 – Classification of mechanical conditions according to IEC 60721-3-2:2018, Table 5

Environmental parameter	Unit	Class		
		2M4		
a) Stationary vibration, random:				
acceleration power spectral density	$(m/s^2)^2/Hz$	$10^{2)}$	1,0	0,5
frequency range [1)]	Hz	2 to 3	10 to 20	50 to 2 000
b) Non-stationary vibration including shock:[3)]		Figure A.1 *Curve 4* (equivalent to a half sine pulse of 100 m/s^2 and 11 ms duration)		
Shock 1[4)]				
Shock 2[4)]		Figure A.1 *Curve 2* (equivalent to a half sine pulse of 300 m/s^2 and 6 ms duration)		
c) Free fall:				
mass less than 20 kg	m	0,25		
mass 20 kg to 100 kg	m	0,25		
mass more than 100 kg	m	0,1		
d) Toppling:				
mass less than 20 kg	None	Toppling around any of the edges		
mass 20 kg to 100 kg		No		
mass more than 100 kg		No		
e) Rolling, pitching:	degrees	No		
angle[5)] period		No		
f) Steady-state acceleration	m/s^2	20		
g) Static load	kPa	5		

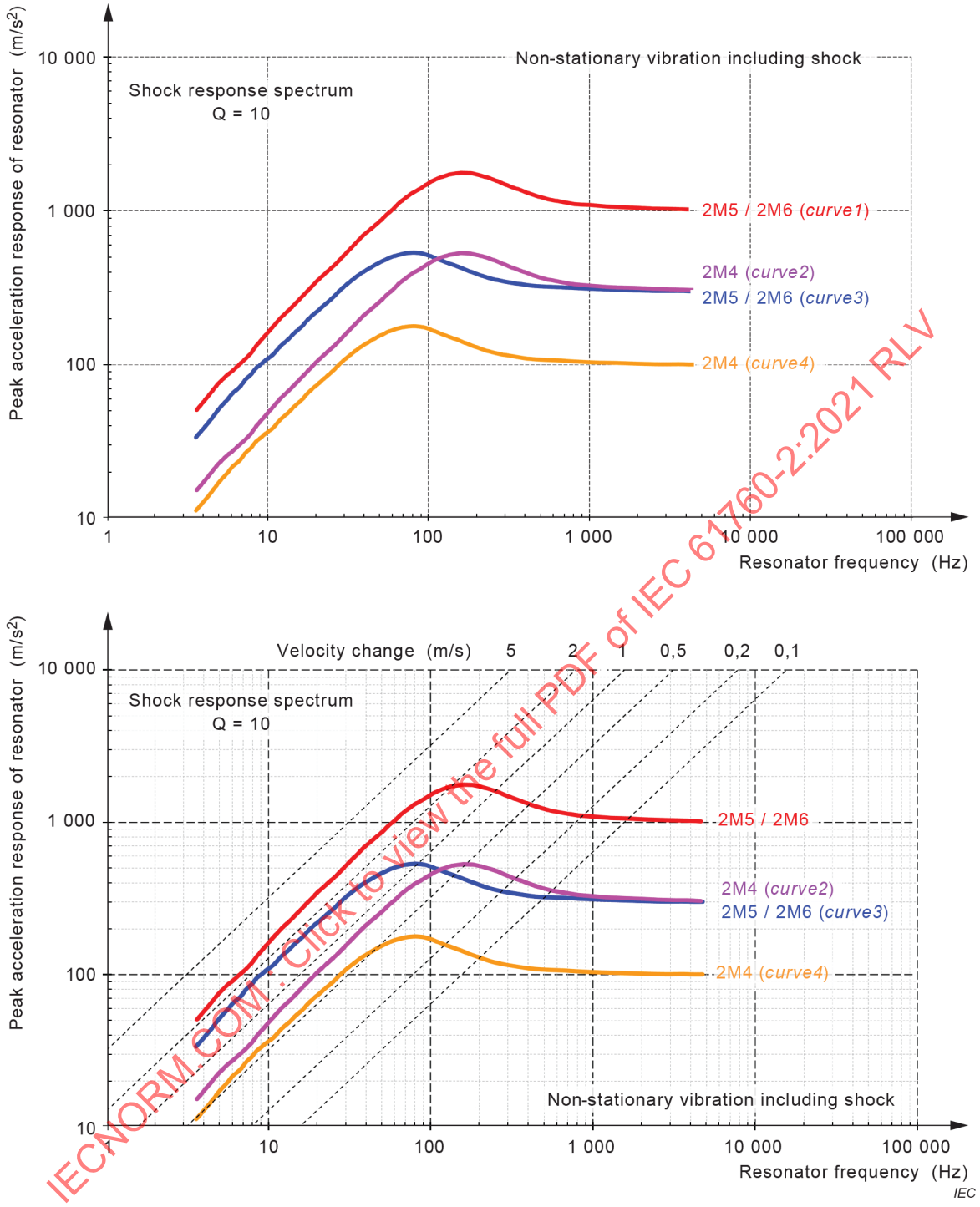
1) When transport only occurs by rail, river, sea and road, the upper frequency considered may be reduced to 500 Hz for products that are not sensitive to vibration excitations above 500 Hz.

2) The low frequency stationary vibration random component arises from the influence of land vehicle suspension systems. The component is included for design purposes but is not always included in vibration test specifications.

3) For land vehicles, these shocks can occur simultaneously with the stationary vibration random conditions.

4) Both shocks would normally be used to encompass different aspects of the shock environment.

5) An angle of 35° may only occur temporarily. An angle of up to 22,5° can be reached for long periods of time.



SOURCE: IEC 60721-3-2:2018, Figure 2

Figure A.1 – Consolidation of mechanical conditions

Table A.3 – Storage conditions according to IEC 60721-3-1:2018, Table 1

Environmental Parameter	Unit	Class	Conditions used in this document instead of those of class 1K21
		1K21	
a) Low air temperature	°C	+5	
b) High air temperature	°C	+40	
c) Low relative humidity [1)]	%	5	10
d) High relative humidity [1)]	%	85	75
e) Low absolute humidity [1)]	g/m^3	1	
f) High absolute humidity [1)]	g/m^3	25	
g) Rate of change of temperature [2)]	°C/min	0,5	
h) Low air pressure [3)]	kPa	70	
i) High air pressure [3)]	kPa	106	
j) Solar radiation	W/m^2	6)	700[8)]
k) Heat radiation	Not specified	7)	
l) Movement of surrounding air [4)]	m/s	1,0	
m) Condensation	Not specified	No	
n) Precipitation (rain, snow, hail, etc.)	Not specified	No	
o) Rain intensity	mm/min	None	
p) Driving rain	m/s	None	
q) Snow load	kg/m^2	None	
r) Low rain temperature [5)]	°C	None	
s) Water from sources other than rain	$L/m^2/min$	No	
t) Formation of ice and frost (including freeze-thaw)	Not specified	No	

1) The low and high relative humidity levels are limited by the low and high absolute humidities, so that, for example, for environmental parameters a) and c), or b) and d), the severities given in Table 1 do not occur simultaneously.

2) Averaged over a period of time of 5 min.

3) The value of 70 kPa represents a limit for open-air conditions, normally at an altitude of 3 000 m. In some geographical areas, open-air conditions can occur at higher altitudes. Conditions in mines are not considered.

4) A cooling system based on non-assisted convection can be disturbed by adverse movement of surrounding air.

5) This rain temperature should be considered together with high air temperature b) and solar radiation j). The cooling effect of the rain has to be considered in connection with the surface temperature of the product.

6) Either 500 W/m^2 or 700 W/m^2.

7) Either 1Z1 = negligible or 1Z2 = conditions of heat radiation, e.g. in the vicinity of room heating system.

8) In this document: direct solar radiation should be avoided.

Annex X
(informative)

Cross-references for references to the previous edition of this document

The revision of this document has resulted in a new structure. Table X.1 provides cross-references for all references to specific elements of the previous edition.

Table X.1 – Cross-references

IEC 61760-2:2007 (Edition 2.0) Clause/subclause	IEC 61760-2:2021 (Edition 3.0) Clause/subclause	Notes
1	1	
2	2	
-	3	
3	4	
4	5	
4.1	5.1	
4.2	5.2	
-	5.2.1	
4.2.1	5.2.2	
4.2.2	5.2.3	
5	6	
6	7	
Annex A	Annex A	
-	Annex X	
Table A.1	Table A.1	
Table A.2	Table A.2	
Table A.3	Table A.3	

Bibliography

IEC 60286-3, *Packaging of components for automatic handling – Part 3: Packaging of surface mount components on continuous tapes*

IEC 60286-4, *Packaging of components for automatic handling – Part 4: Stick magazines for electronic components encapsulated in packages of different forms*

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IEC 60749 (all parts), *Semiconductor devices – Mechanical and climatic test methods*

IEC 60749-20-1:2019, *Semiconductor devices – Mechanical and climatic test methods – Part 20-1: Handling, packing, labelling and shipping of surface-mount devices sensitive to the combined effect of moisture and soldering heat*

IEC 61340-5-1, *Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements*

IEC TR 61340-5-2, *Electrostatics – Part 5-2: Protection of electronic devices from electrostatic phenomena – User guide*

IEC TR 61340-5-5, *Electrostatics – Part 5-5: Protection of electronic devices from electrostatic phenomena – Packaging systems used in electronic manufacturing*

IEC 61760-4:2015, *Surface mounting technology – Part 4: Classification, packaging, labelling and handling of moisture sensitive devices*
IEC 61760-4:2015/AMD1:2018

IEC 62435 (all parts), *Electronic components – Long-term storage of electronic semiconductor devices*

IPC/JEDEC J-STD-033D, 2018, *Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface-Mount Devices*

IEC 61760-2

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colour inside

Surface mounting technology – Part 2: Transportation and storage conditions of surface mounting devices (SMD) – Application guide

Technique du montage en surface – Partie 2: Conditions de transport et de stockage des composants pour montage en surface (CMS) – Guide d'application

IEC 61760-2:2021-07(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SURFACE MOUNTING TECHNOLOGY –

Part 2: Transportation and storage conditions of surface mounting devices (SMD) – Application guide

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 61760-2 has been prepared by IEC technical committee 91: Electronics assembly technology. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
91/1666/CDV	91/1708/RVC

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 International Standard 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/standardsdev/publications.

Cross-references for references from this edition 3 to the previous edition 2 of this document are listed in Annex X of this document.

A list of all parts in the IEC 61760 series, published under the general title *Surface mounting technology*, 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
- amended.

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SURFACE MOUNTING TECHNOLOGY –

Part 2: Transportation and storage conditions of surface mounting devices (SMD) – Application guide

1 Scope

This International Standard specifies the transportation and storage conditions for surface mounting devices (SMDs) that are fulfilled in order to enable trouble-free processing of surface mounting devices, both active and passive. (Conditions for printed boards are not taken into consideration.)

The object of this document is to ensure that users of SMDs receive and store products that can be further processed (e.g. positioned, soldered) without prejudice to quality and reliability. Improper transportation and storage of SMDs can cause deterioration and result in assembly problems such as poor solderability, delamination and "popcorning".

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 60721-3-1:2018, *Classification of environmental conditions – Part 3-1: Classification of groups of environmental parameters and their severities – Storage*

IEC 60721-3-2:2018, *Classification of environmental conditions – Part 3-2: Classification of groups of environmental parameters and their severities – Transportation and handling*

3 Terms and definitions

ISO and IEC maintain terminological 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

No terms and definitions are listed in this document.

4 General conditions

Surface mounting devices shall be packed in such a way that products are protected during transportation and storage without loss of their properties arising from mechanical, environmental and electrical influences. Packing requirements as defined in various IEC publications, such as IEC 60286-3, IEC 60286-4, IEC 60286-5, IEC 60286-6 and IEC TR 61340-5-5 can contribute to the protection of components during transportation and storage.

If dry packing is specified and used, the IEC publications IEC 61760-4, IEC 60749-20-1 and IPC/JEDEC J-STD-033 should be consulted.

Usually, transportation conditions are less controlled than storage conditions. Nevertheless, conditions shall be controlled and deviations from the advised conditions in this document should be reduced to as little time as possible.

5 Transportation conditions

5.1 General transportation conditions

During transportation, the SMDs, including their chosen style of tapes or stick magazines, etc., shall be protected against extreme temperature, humidity, and mechanical forces. Unless otherwise specified by the component supplier, the following environmental conditions shall be met:

Climatic condition are according to IEC 60721-3-2:2018, class 2K12. Deviations from these conditions are listed below:

– low air temperature: −40 °C;
– low air pressure: 30 kPa;
– change of air pressure: 6 kPa/min; high relative humidity 75 %;
– no dripping water;
– no condensation is allowed.

The conditions are presented in tabular form in Annex A, Table A.1.

The total number of extreme temperature events (close to limits) should be limited to a minimum during transportation and storage.

Mechanical condition is according to IEC 60721-3-2:2018, class 2M4. The condition is presented in tabular form, including a figure, in Annex A, Table A.2 and Figure A.1.

Transportation shall be managed in such a way that boxes are not deformed and forces are not directly passed on to the inner packaging.

Total transportation time shall be as short as possible, but preferably not exceeding 10 days. (Total transportation time is time when products are not within controlled storage conditions.)

5.2 Special transportation conditions

5.2.1 General

Depending on the sensitivity of the products to be transported, a choice shall be made between air transport, where conditions during flight are well controlled, or less controlled conditions, e.g. during rail or road transportation.

5.2.2 Category 1 (advised for all products)

Air transport (conditions during flights with conditioned cargo room).

Climatic conditions are according to IEC 60721-3-2:2018, class 2K11. Deviations from these conditions are listed below:

– low air temperature −40 °C;
– low relative humidity 10 %;
– high relative humidity 75 %;
– low air pressure 30 kPa.

The conditions are presented in tabular form in Annex A, Table A.1.

It should be realised that waiting time and loading operations at the airport are under less controlled conditions. These shall at least fulfil the general transportation conditions stated in 5.1.

5.2.3 Category 2

Rail, road, and unconditioned air transportation.

Only allowed for products and packaging systems that are not sensitive to the general transportation conditions stated in 5.1.

Minimum air pressure: corresponding to an altitude of < 12 km (about 19,3 kPa).

6 Storage conditions

Well controlled storage conditions are a major factor in problem prevention. Do not store in locations where the soldering properties can be deteriorated by harmful gases. Conditions that can expose products to detrimental electrical field strengths should be avoided. Exposure of the products to direct solar radiation should be avoided.

The following conditions are advised:

Climatic conditions are according to IEC 60721-3-1:2018, class 1K21. Deviations from these conditions are listed below:

– low relative humidity 10 %;
– high relative humidity 75 %;
– solar radiation 700 W/m^2, but direct solar radiation should be avoided.

The conditions are presented in tabular form in Annex A, Table A.3.

The storage time as given by the manufacturer specification shall not be exceeded. It is however recommended that the total storage time should not exceed two years (manufacturer and customer) but should be limited to one year after receipt of the products by the customer. In specific cases, the exact storage time and the re-qualification rules, if the time is exceeded, are given in the component specification. As a minimum, at least the solderability of the components shall be re-qualified.

If longer storage times are needed, the manufacturer should be consulted to conclude arrangements for suitable storage and packaging conditions.

During storage the original smallest packaging unit (SPU) shall not be opened, the SPU should preferably remain in the original packaging.

Even though products are stored for a shorter period of time, it is advised to apply the temperature and humidity conditions set out in this Clause 6.

For "last call" components, the storage conditions to conserve the component's properties shall be agreed between the manufacturer and the user.

7 Related issues

If the products in standard packaging do not fulfil the required quality and reliability goals under the shipment and storage conditions as described in Clause 5 and Clause 6, special actions shall be considered as described in IEC 60749 (all parts), IEC 61340-5-1 and IEC TR 61340-5-2.

Considerations for risk mitigation, packaged component long-term storage and associated traceability, can be found in IEC 62435 (all parts).

Annex A
(informative)

Transportation and storage conditions

For easy and rapid reference, this Annex A shows the content of the quoted conditions from IEC 60721-3-1:2018 and IEC 60721-3-2:2018.

The information is presented on following pages in tabular form in Table A.1, Table A.2 and Table A.3. In each table the deviations given in this document from conditions provided in IEC 60721-3-2 and from IEC 60721-3-1 are specified, if any.

Table A.1 – Classification of climatic conditions according to IEC 60721-3-2:2018, Table 1.

Table A.2 – Classification of mechanical conditions according to IEC 60721-3-2:2018, Table 5 and Figure 2.

Table A.3 – Storage conditions according to IEC 60721-3-1:2018, Table 1.

Table A.1 – Classification of climatic conditions according to IEC 60721-3-2:2018, Table 1

Environmental parameter	Unit	Classification			
		Weather-protected		Conditions used in this document instead of those of IEC 60721-3-2	
		2K11	2K12	2K11	2K12
a) Low air temperature	°C	+5	–45	–40	–40
b) High air temperature	°C	+40	+70	+60	+60
c) Low relative humidity [1)]	%	5	4	10	10
d) High relative humidity [1)]	%	85	100	75	75
e) Low absolute humidity [1)]	g/m^3	1	0,5		
f) High absolute humidity [1)]	g/m^3	25	29		
g) Rate of change of temperature [2)]	°C/min	0,5	1,0		
h) Low air pressure [3)]	kPa	70	70	30	30
i) High air pressure [3)]	kPa	106	106	[7)]	[7)]
j) Solar radiation	W/m^2	No	[6)]		
k) Heat radiation	Not specified	None	None		
l) Movement of surrounding air [4)]	m/s	1,0	1,0		
m) Condensation	Not specified	No	Yes		No
n) Precipitation (rain, snow, hail, etc.)	Not specified	No	No		
o) Rain intensity	mm/min	None	None		
p) Driving rain	m/s	None	None		
q) Snow load	kg/m^2	None	None		
r) Low rain temperature [5)]	°C	None	None		
s) Water from sources other than rain	Not specified	No	Dripping Water		No
t) Formation of ice and frost (including freeze-thaw)	Not specified	No	Yes		
u) Temperature shock	Not specified	No	Yes		

1) The low and high relative humidity levels are limited by the low and high absolute humidity, so that, for example, for environmental parameters a) and c), or b) and d), the severities given in Table A.1 do not occur simultaneously.

2) Averaged over a period of time of 5 min.

3) The value of 70 kPa represents a limit for open-air conditions, normally at an altitude of 3 000 m. In some geographical areas, open-air conditions can occur at higher altitudes. Conditions in mines are not considered.

4) A cooling system based on non-assisted convection can be disturbed by adverse movement of surrounding air.

5) This rain temperature should be considered together with high air temperature b) and solar radiation j). The cooling effect of the rain has to be considered in connection with the surface temperature of the product.

6) Thermal effect of solar radiation is included in the temperature.

7) Extra requirement in this document: change of air pressure 6 kPa/min.

Table A.2 – Classification of mechanical conditions according to IEC 60721-3-2:2018, Table 5

Environmental parameter	Unit	Class		
		2M4		
a) Stationary vibration, random:				
acceleration power spectral density	$(m/s^2)^2/Hz$	$10^{2)}$	1,0	0,5
frequency range [1)]	Hz	2 to 3	10 to 20	50 to 2 000
b) Non-stationary vibration including shock:[3)]		Figure A.1 *Curve 4* (equivalent to a half sine pulse of 100 m/s^2 and 11 ms duration)		
Shock 1[4)]				
Shock 2[4)]		Figure A.1 *Curve 2* (equivalent to a half sine pulse of 300 m/s^2 and 6 ms duration)		
c) Free fall:				
mass less than 20 kg	m	0,25		
mass 20 kg to 100 kg	m	0,25		
mass more than 100 kg	m	0,1		
d) Toppling:				
mass less than 20 kg	None	Toppling around any of the edges		
mass 20 kg to 100 kg		No		
mass more than 100 kg		No		
e) Rolling, pitching:	degrees	No		
angle[5)] period		No		
f) Steady-state acceleration	m/s^2	20		
g) Static load	kPa	5		

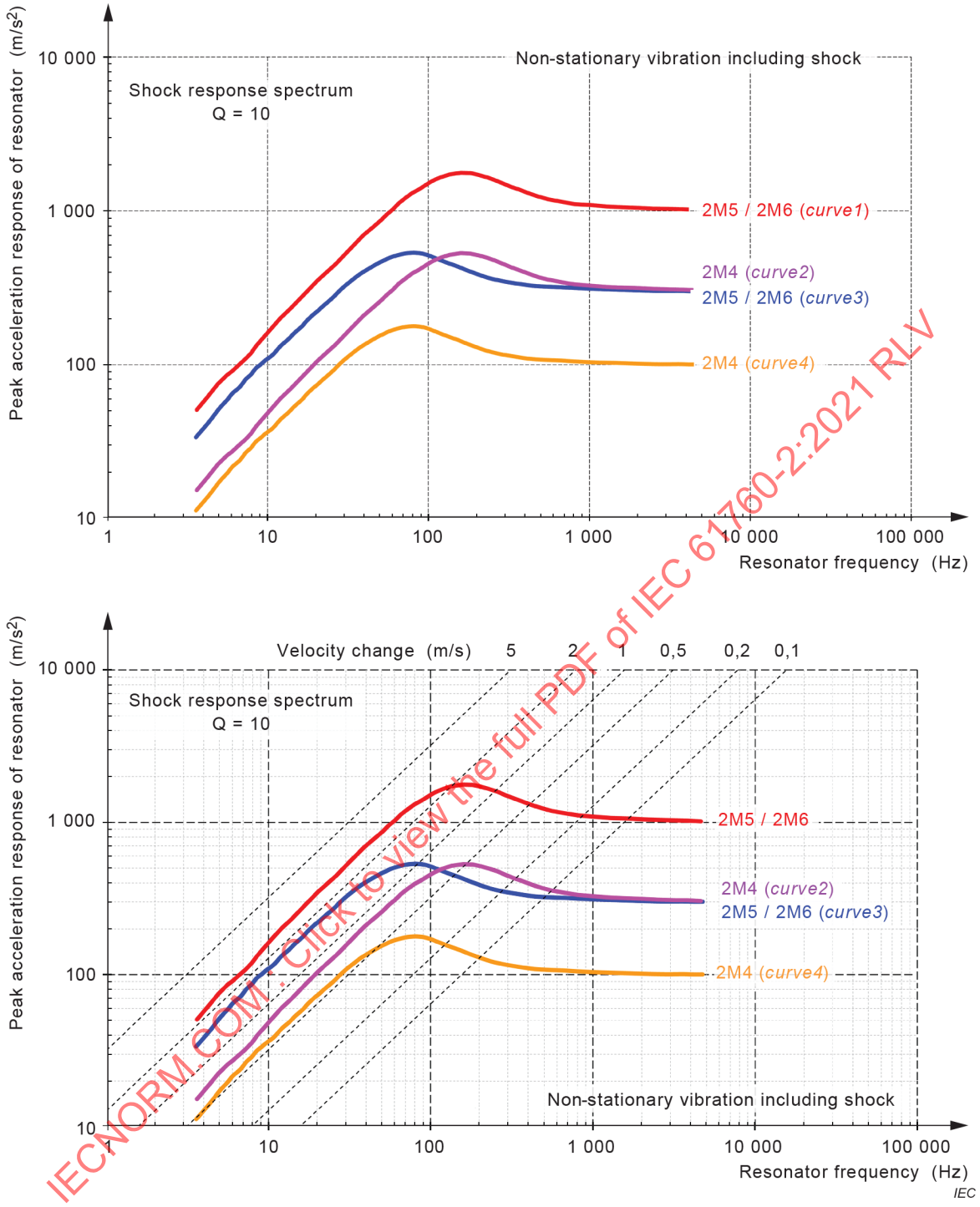
1) When transport only occurs by rail, river, sea and road, the upper frequency considered may be reduced to 500 Hz for products that are not sensitive to vibration excitations above 500 Hz.

2) The low frequency stationary vibration random component arises from the influence of land vehicle suspension systems. The component is included for design purposes but is not always included in vibration test specifications.

3) For land vehicles, these shocks can occur simultaneously with the stationary vibration random conditions.

4) Both shocks would normally be used to encompass different aspects of the shock environment.

5) An angle of 35° may only occur temporarily. An angle of up to 22,5° can be reached for long periods of time.



SOURCE: IEC 60721-3-2:2018, Figure 2

Figure A.1 – Consolidation of mechanical conditions

Table A.3 – Storage conditions according to IEC 60721-3-1:2018, Table 1

Environmental Parameter	Unit	Class	Conditions used in this document instead of those of class 1K21
		1K21	
a) Low air temperature	°C	+5	
b) High air temperature	°C	+40	
c) Low relative humidity [1)]	%	5	10
d) High relative humidity [1)]	%	85	75
e) Low absolute humidity [1)]	g/m^3	1	
f) High absolute humidity [1)]	g/m^3	25	
g) Rate of change of temperature [2)]	°C/min	0,5	
h) Low air pressure [3)]	kPa	70	
i) High air pressure [3)]	kPa	106	
j) Solar radiation	W/m^2	6)	700[8)]
k) Heat radiation	Not specified	7)	
l) Movement of surrounding air [4)]	m/s	1,0	
m) Condensation	Not specified	No	
n) Precipitation (rain, snow, hail, etc.)	Not specified	No	
o) Rain intensity	mm/min	None	
p) Driving rain	m/s	None	
q) Snow load	kg/m^2	None	
r) Low rain temperature [5)]	°C	None	
s) Water from sources other than rain	$L/m^2/min$	No	
t) Formation of ice and frost (including freeze-thaw)	Not specified	No	

1) The low and high relative humidity levels are limited by the low and high absolute humidities, so that, for example, for environmental parameters a) and c), or b) and d), the severities given in Table 1 do not occur simultaneously.

2) Averaged over a period of time of 5 min.

3) The value of 70 kPa represents a limit for open-air conditions, normally at an altitude of 3 000 m. In some geographical areas, open-air conditions can occur at higher altitudes. Conditions in mines are not considered.

4) A cooling system based on non-assisted convection can be disturbed by adverse movement of surrounding air.

5) This rain temperature should be considered together with high air temperature b) and solar radiation j). The cooling effect of the rain has to be considered in connection with the surface temperature of the product.

6) Either 500 W/m^2 or 700 W/m^2.

7) Either 1Z1 = negligible or 1Z2 = conditions of heat radiation, e.g. in the vicinity of room heating system.

8) In this document: direct solar radiation should be avoided.

Annex X
(informative)

Cross-references for references to the previous edition of this document

The revision of this document has resulted in a new structure. Table X.1 provides cross-references for all references to specific elements of the previous edition.

Table X.1 – Cross-references

IEC 61760-2:2007 (Edition 2.0) Clause/subclause	IEC 61760-2:2021 (Edition 3.0) Clause/subclause	Notes
1	1	
2	2	
-	3	
3	4	
4	5	
4.1	5.1	
4.2	5.2	
-	5.2.1	
4.2.1	5.2.2	
4.2.2	5.2.3	
5	6	
6	7	
Annex A	Annex A	
-	Annex X	
Table A.1	Table A.1	
Table A.2	Table A.2	
Table A.3	Table A.3	

Bibliography

IEC 60286-3, *Packaging of components for automatic handling – Part 3: Packaging of surface mount components on continuous tapes*

IEC 60286-4, *Packaging of components for automatic handling – Part 4: Stick magazines for electronic components encapsulated in packages of different forms*

IEC 60286-5, *Packaging of components for automatic handling – Part 5: Matrix trays*

IEC 60286-6, *Packaging of components for automatic handling – Part 6: Bulk case packaging for surface mounting components*

IEC 60749 (all parts), *Semiconductor devices – Mechanical and climatic test methods*

IEC 60749-20-1:2019, *Semiconductor devices – Mechanical and climatic test methods – Part 20-1: Handling, packing, labelling and shipping of surface-mount devices sensitive to the combined effect of moisture and soldering heat*

IEC 61340-5-1, *Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements*

IEC TR 61340-5-2, *Electrostatics – Part 5-2: Protection of electronic devices from electrostatic phenomena – User guide*

IEC TR 61340-5-5, *Electrostatics – Part 5-5: Protection of electronic devices from electrostatic phenomena – Packaging systems used in electronic manufacturing*

IEC 61760-4:2015, *Surface mounting technology – Part 4: Classification, packaging, labelling and handling of moisture sensitive devices*
IEC 61760-4:2015/AMD1:2018

IEC 62435 (all parts), *Electronic components – Long-term storage of electronic semiconductor devices*

IPC/JEDEC J-STD-033D, 2018, *Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface-Mount Devices*

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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TECHNIQUE DU MONTAGE EN SURFACE –

Partie 2: Conditions de transport et de stockage des composants pour montage en surface (CMS) – Guide d'application

AVANT-PROPOS

1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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L'IEC 61760-2 a été établie par le Comité d'études 91 de l'IEC: Techniques d'assemblage des composants électroniques. Il s'agit d'une Norme internationale.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
91/1666/CDV	91/1708/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

Les références croisées donnant les équivalences entre la présente édition 3 et l'édition 2 du présent document sont énumérées à l'Annexe X du présent document.

Une liste de toutes les parties de la série IEC 61760, publiées sous le titre général *Technique du montage en surface*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

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TECHNIQUE DU MONTAGE EN SURFACE –

Partie 2: Conditions de transport et de stockage des composants pour montage en surface (CMS) – Guide d'application

1 Domaine d'application

La présente Norme internationale spécifie les conditions de transport et de stockage qui sont prises en compte afin de permettre la mise en œuvre sans problème des composants pour montage en surface (CMS), tant actifs que passifs. (Les conditions pour les cartes à circuits imprimés ne sont pas prises en compte.)

L'objet du présent document est de s'assurer que l'utilisateur de composants pour montage en surface reçoit et emmagasine des produits qui pourront être utilisés (par exemple placés, brasés) sans problème de qualité et de fiabilité. Des conditions de transport et de stockage impropres peuvent provoquer une détérioration des CMS et il en résulte des problèmes d'assemblage tels qu'une mauvaise brasabilité, la séparation des couches métallisées des terminaisons et l'effet "pop-corn".

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60721-3-1:2018, *Classification des conditions d'environnement – Partie 3-1: Classification des groupements des agents d'environnement et de leurs sévérités – Stockage*

IEC 60721-3-2:2018, *Classification des conditions d'environnement – Partie 3-2: Classification des groupements des agents d'environnement et de leurs sévérités – Transport et manutention*

3 Termes et définitions

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

Aucun terme n'est défini dans le présent document.

4 Conditions générales

Les composants pour montage en surface doivent être conditionnés de telle sorte que les produits soient protégés, durant le transport et le stockage, contre une perte de leurs caractéristiques occasionnée par des influences mécaniques, électriques et d'environnement. Les exigences relatives au conditionnement définies dans diverses publications de l'IEC, telles que l'IEC 60286-3, l'IEC 60286-4, l'IEC 60286-5, l'IEC 60286-6 et l'IEC TR 61340-5-5, peuvent contribuer à la protection des composants durant leur transport et leur stockage.

Si un emballage à sec est spécifié et utilisé, il convient de consulter les publications de l'IEC (IEC 61760-4, IEC 60749-20-1 et la norme commune IPC/JEDEC J-STD-033).

Il est courant que les conditions de transport soient moins contrôlées que les conditions de stockage. Cependant, ces conditions doivent être vérifiées et il convient que les écarts par rapport aux conditions recommandées dans le présent document soient limités à un temps aussi court que possible.

5 Conditions de transport

5.1 Conditions générales de transport

Pendant leur transport, les composants pour montage en surface, ainsi que le conditionnement choisi, bandes ou magasins chargeurs, doivent être protégés contre toute contrainte mécanique, de température ou d'humidité qui atteigne un niveau extrême. Sauf spécification contraire du fournisseur, les conditions d'environnement suivantes doivent être remplies:

Les conditions climatiques sont conformes à l'IEC 60721-3-2:2018, classe 2K12. Les écarts par rapport à ces conditions sont énumérés ci-après:

– basse température de l'air: −40 °C;
– basse pression atmosphérique: 30 kPa;
– variations de pression atmosphérique: 6 kPa/min; forte humidité relative 75 %;
– absence de gouttelettes d'eau;
– aucune condensation n'est admise.

Les conditions sont présentées au format tabulaire dans le Tableau A.1 de l'Annexe A.

Il convient de limiter au minimum le nombre total d'événements de température extrême (proche des limites) pendant le transport et le stockage.

La condition mécanique est conforme à l'IEC 60721-3-2:2018, classe 2M4. La condition est présentée au format tabulaire dans le Tableau A.2 de l'Annexe A, ainsi qu'à la Figure A.1.

Le transport doit être organisé de sorte que les boîtes d'emballage ne soient pas déformées et que des contraintes ne soient pas directement transmises au conditionnement interne.

Le temps de transport total doit être aussi court que possible, de préférence n'excédant pas 10 jours. (Le temps de transport total comprend la durée pendant laquelle les produits ne sont pas soumis à des conditions de stockage contrôlées.)

5.2 Conditions spéciales de transport

5.2.1 Généralités

En fonction de la sensibilité des produits transportés, le choix doit être fait entre le transport aérien, pour lequel les conditions en vol sont maintenues sous contrôle, et d'autres moyens de transport ayant des conditions moins bien contrôlées, par exemple la route ou le rail.

5.2.2 Catégorie 1 (recommandée pour tous les produits)

Transport aérien (conditions durant les vols avec compartiment cargo pressurisé).

Les conditions climatiques sont conformes à l'IEC 60721-3-2:2018, classe 2K11. Les écarts par rapport à ces conditions sont énumérés ci-après:

– basse température de l'air −40 °C;

– faible humidité relative 10 %;
– forte humidité relative 75 %;
– basse pression atmosphérique 30 kPa.

Les conditions sont présentées au format tabulaire dans le Tableau A.1 de l'Annexe A.

Il convient de noter que les conditions d'attente et de chargement à l'aéroport sont moins bien contrôlées. Elles doivent au moins répondre aux conditions générales de transport indiquées en 5.1.

5.2.3 Catégorie 2

Rail, route et transport aérien non pressurisé.

Ces conditions sont seulement autorisées pour les produits et emballages non sensibles aux conditions générales de transport décrites en 5.1.

La pression atmosphérique minimale correspond à une altitude < 12 km (environ 19,3 kPa).

6 Conditions de stockage

Des conditions de stockage bien contrôlées sont un facteur majeur dans la prévention des problèmes. Ne pas stocker les produits dans un endroit où les propriétés de brasage peuvent être détériorées par des gaz dangereux. Il convient d'éviter les situations pouvant exposer les produits à des forces de champ électrique nuisibles. Il convient d'éviter d'exposer les produits au rayonnement solaire direct.

Les conditions suivantes sont recommandées:

Les conditions climatiques sont conformes à l'IEC 60721-3-1:2018, classe 1K21. Les écarts par rapport à ces conditions sont énumérés ci-après:

- faible humidité relative 10 %;
- forte humidité relative 75 %;
- rayonnement solaire 700 W/m^2, mais il convient d'éviter le rayonnement solaire direct.

Les conditions sont présentées au format tabulaire dans le Tableau A.3 de l'Annexe A.

La durée de stockage spécifiée par le fabricant ne doit pas être dépassée. Il est cependant recommandé que la durée de stockage totale ne dépasse pas deux ans (par le fabricant et le consommateur) mais il convient qu'elle soit limitée à un an après la réception des produits par le consommateur. Pour les situations particulières, la durée de stockage exacte ainsi que les règles de requalification, en cas de dépassement de cette durée, sont indiquées dans la spécification du composant. Au minimum, la brasabilité des composants doit faire l'objet d'une requalification.

S'il s'avère nécessaire de stocker les composants plus longtemps, il convient de consulter le fabricant pour convenir de conditions de stockage et d'emballage appropriées.

Pendant le stockage, la plus petite unité de conditionnement (SPU, Smallest Packaging Unit) ne doit pas être ouverte. Il convient que cette unité reste de préférence dans l'emballage d'origine.

Lorsque les produits sont stockés pour des périodes plus courtes que celles spécifiées, il est malgré tout recommandé d'appliquer les conditions de température et d'humidité mentionnées dans le présent Article 6.