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INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Attachment materials for electronic assembly – Part 1-3: Requirements for electronic grade solder alloys and fluxed and non-fluxed solid solders for electronic soldering applications

Matériaux de fixation pour les assemblages électroniques – Partie 1-3: Exigences relatives aux alliages à braser de catégorie électronique et brasures solides fluxées et non fluxées pour les applications de brasage électronique

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FOREWORD

This amendment has been prepared by IEC technical committee 91: Electronics assembly technology

The text of this amendment is based on the following documents:

FDIS	Report on voting
91/920/FDIS	91/925/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

Delete in the foreword the totality of the existing patent statements.

Add the following new page INTRODUCTION with the following text

INTRODUCTION

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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Cookson Electronics Assembly Materials
600 Route 440 Jersey City,New Jersey 07304

US PAT No. 5527628
Iowa State University Research Foundation, Inc.
310 Lab of Mechanics
Ames, Iowa 50011-2131, U.S.A.

JP PAT No. 3040929
JP PAT No. 3027441
Matsushita Electric Industrial Co., Ltd.
Matsushita IMP Building 20F 1-3-7, Shiromi, Chouh-ku, Osaka, 540-6319, Japan

JP PAT No. 2805595
Mitsui Mining & Smelting Co., Ltd.
Gate City Ohsaki-West Tower 19th Fl. 1-11-1 Osaki, Shinagawa-ku, Tokyo, 141-8584, Japan

JP PAT No. 3027441
Senju Metal Industry Co., Ltd.
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2 Normative references

Remove the existing reference ISO 9453 and replace it by the following new reference:

ISO 9453:2006, *Soft solders alloys – Chemical compositions and forms*

4.1 Alloy composition

Add the following note at the end of this subclause:

N0TE The alloy short name can be used as identifier of solder alloy(s) in mounted boards used in electrical and electronic equipment (see Annex C).

Table B.1 – Composition, and temperature characteristics of lead-free solder alloys

Replace the entire Table B.1 by the following new Table B.1:

Table B.1 – Composition, and temperature characteristics of lead-free solder alloys[1] [a, b]

Alloy name	Short name [d]	Sn %	Cu %	Bi %	In %	Ag %	Sb %	Other component elements	Temperature °C	
									Solidus	Liquidus
Sn100 [c]	Sn100	99,9							232	mp
Sn97Ag3	A30	REM-97,0				3			221	224
Sn95Ag5	A50	REM-95,0				5			221	240
Sn96,5Ag3,5	A35	REM-96,5				3,5			221	ea
Sn96,3Ag3,7	A37	REM-96,3				3,7			221	228
Sn99Cu,7Ag,3	C7A3	REM-99,0	0,7	–	–	0,3±0,10	–	–	217	227
Sn98.97Cu,7Ag,3Ni,03	C7A3Ni	REM-98,97	0,7	–	–	0,3±0,10	–	Ni0.03±0.01	218	228
Sn98.3Cu,7Ag1	C7A10	REM-98,7	0,7	–	–	1,0	–		217	224
Sn95Cu4Ag1	C40A10	REM-95,0	4,0±0,50	–	–	1,0	–	–	217	353
Sn92Cu6Ag2	C60A20	REM-92,0	6,0	–	–	2,0	–	–	217	380
Sn96,5Ag3Cu,5	A30C5	REM-96,5	0,5	–	–	3,0	–	–	217	220
Sn95,8Ag3,5Cu,7	A35C7	REM-95,8	0,7	–	–	3,5	–	–	217	218
Sn95,5Ag3,8Cu,7	A38C7	REM-95,5	0,7			3,8			217	226
Sn95,5Ag4,0Cu,5	A40C5	REM–95,5	0,5	–	–	4,0	–	–	217	229
Sn96Ag2,5Bi1Cu,5	A25B10C5	REM-96,0	0,5	1,0		2,5			213	218
Sn42Bi58	B580	REM-42,0	–	58,0	–	–	–	–	139	ea
Sn99,3Cu,7	C7	REM-99,3	0,7	–	–	–	–	–	227	ea
Sn97Cu3	C30	REM-97,0	3,0	–	–	–	–	–	227	310
Sn48In52	N520	REM-48,0	–	–	52	–	–	–	118	ea
Sn88In8Ag3,5Bi,5	N80A35B5	REM-88,0	–	0,5	8,0	3,5	–	–	196	206
Sn92In4Ag3,5Bi,5	N40A35B5	REM-92,0	–	0,5	4,0	3,5	–	–	210	216
Sn95Sb5	S50	REM-95,0					5,0±0,50		235	240
Sn91Zn9	Z90	REM-91,0	–	–	–	–	–	Zn9,0	199	ea
Sn89Zn8Bi3	Z80B30	REM-89,0	–	3,0	–	–	–	Zn8,0	190	197

[a] Except where otherwise indicated, the component elements in each alloy should not vary from their tabulated percentage by more than the following.

If ≤5 % of total alloy variation equals ±0,2 %,

If >5 % of total alloy variation equals ±0,5 %,

The letters "REM" appearing with a NUMBER for an element of an alloy (e.g. REM-10,0) denotes that the element makes up the REMAINDER of that alloy with its actual percentage calculated as a difference from 100 %, the NUMBER indicates the approximate percentage of that element in the alloy.

[b] The solidus and liquidus temperature values are provided for information only and are not intended to be a requirement in the formulation of the alloys. In the “Liquidus” column, “ea” indicates eutectic alloys and “mp” indicates the tabulated solidus temperature representing the melting point for the elements (Sn100). Although efforts have been made to document the correct solidus and liquidus temperatures for each alloy, users of this standard are advised to verify these temperature values before use.

[c] Alloy Sn100 is included in this document for use in replenishing tin in wave soldering baths and is not suitable for use as a stand-alone solder because of potential tin pest problems. Do not use alloy Sn100 as a stand-alone solder on hardware being fabricated for a government unless it is specifically identified for such use in a government-approved end item drawing, specification, or waiver.

[d] Short name definitions for lead-free alloys.

[1] For footnotes to Table B.1, see the following page

Alloy name	Short name [d]	Sn %	Cu %	Bi %	In %	Ag %	Sb %	Other component elements	Temperature °C	
									Solidus	Liquidus

For labelling purposes, in cases of limited space, a short name code is available for use according to the guidelines below:

The key alloying elements are identified using one letter as follows:

A silver
B bismuth
C copper
N indium
S antimony
Z zinc
Ni nickel

The short name does not indicate the base element (i.e. tin) in lead-free alloys as this is assumed.

Digits are used to indicate percentage of key elements as follows:

x = 0,x % (for example 5 corresponds to 0,5 % by weight)
xx = x,x % (for example 55 corresponds to 5,5 % by weight)
xxx = xx,x % (for example 505 corresponds to 50,5 % by weight)
No digits for <0,1% (for example Ni corresponds to Ni0.0X % by weight)

For example, Sn98.97Cu,7Ag,3Ni0.03 has short name C7A3Ni.

Replace the text of Table B.4 by the following new Table B.4:

Table B.4 – Cross reference from solidus and liquidus temperatures to alloy names by temperature[2] [a]

Temperature °C		Alloy name
Solidus	Liquidus	
96	ea	Sn16Pb32Bi52
100	ea	Sn34Pb20Bi46
118	ea	In52Sn48
120	167	Sn46Pb46Bi08
134	181	In26Sn38Pb37
138	ea	Sn42Bi58
140	160	Sn30Cd70
144	163	Sn43Pb43Bi14
145	ea	Sn50Pb32Cd18
149	150	In80Pb15Ag05
153	163	In12Sn70Pb18
156	mp	In100
160	174	In70Pb30
174	185	In60Pb40
178	270	Sn18Pb80Ag02
179	ea	Sn62Pb36Ag02Sb4
179	ea	Sn62Pb36Ag02
180	185	Sn60Pb38Bi02
180	209	In50Pb50
183	ea	Sn63Pb37
183	ea	Sn63Pb37Sb4
183	190	Sn60Pb38Cu02
183	191	Sn60Pb40
183	191	Sn60Pb40Sb4
183	193	Sn70Pb30
183	193	Sn70Pb30Sb4
136	152	In20Sn54Pb26
183	213	Sn90Pb10
183	215	Sn50Pb49Cu01
183	216	Sn50Pb50
183	216	Sn50Pb50Sb4
183	226	Sn45Pb55
183	238	Sn40Pb60
183	238	Sn40Pb60Sb4
183	246	Sn35Pb65
183	246	Sn35Pb65Sb4
183	254	Sn30Pb70
183	254	Sn30Pb70Sb4
183	277	Sn20Pb80
183	277	Sn20Pb80Sb4
184	270	Sn20Pb79Sb01
185	231	Sn40Pb58Sb02
185	243	Sn35Pb63Sb02
185	250	Sn30Pb68Sb02
185	263	Sn25Pb74Sb01
190	197	Sn89Zn8Bi3
195	225	In40Pb60
196	206	Sn88In8Ag3.5Bi,5
199	ea	Sn91Zn9

2 Footnotes to Table B.4 appear at the end of the table.

Temperature °C		Alloy name
Solidus	Liquidus	
210	216	Sn92In4Ag3.5Bi,5
213	218	Sn96Ag2,5Bi1Cu,5
217	218	Sn95,8Ag3,5Cu,7
217	220	Sn96,5Ag3Cu,5
217	224	Sn98.3Cu,7Ag1
217	226	Sn95,5Ag3,8Cu,7
217	227	Sn96Ag2,5Bi1Cu,5
217	229	Sn95,5Ag4Cu,5
217	227	Sn99Cu,7Ag,3
217	353	Sn95Cu4Ag1
217	380	Sn92Cu6Ag2
218	228	Sn98.97Cu,7Ag,3Ni,03
221	ea	Sn96,5Ag3,5
221	224	Sn97Ag3
221	228	Sn96,3Ag3,7
221	240	Sn95Ag5
227	ea	Sn99Cu,7
227	310	Sn97Cu3
232	mp	Sn100
235	240	Sn95Sb5
238	253	In30 Pb70
250	264	In25Pb75
268	290	Sn10Pb88Ag02
270	280	In19Pb81
275	302	Sn10Pb90
280	ea	Au80Sn20
280	284	Sn05Pb93Ag02
280	305	Sn08Pb92
296	301	Sn05Pb94Ag01
299	307	Sn02Pb96Sb02
300	310	In05Pb92Ag03
304	ea	Ag03Pb97
304	380	Ag06Pb94
305	306	Sn03Pb95Ag02
308	312	Sn05Pb95
309	ea	Sn01Pb98Ag01
314	320	Sn03Pb97
320	325	Sn02Pb98
356	ea	Au88Ge12
363	ea	Au97Si03
451	485	Au82In18

a The solidus and liquidus temperature values are provided for information only and are not intended to be a requirement in the formulation of the alloys.

b In the liquidus columns, “ea” indicates eutectic alloys and “mp” indicates the tabulated solidus temperature representing the melting point for the elements (In99A and Sn99A). Although efforts have been made to document the correct solidus and liquidus temperatures for each alloy, users of this standard are advised to verify these temperature values before use.

After Annex B, add the following new Annex C:

Annex C
(informative)

Marking method of solder designation for mounted board, used in electronic equipment

C.1 General

This annex provides the method for the indication of solder alloy(s) in mounted boards used in electrical and electronic equipment.

C.2 Marking

C.2.1 Recommendation for marking

Recommendations for marking are as follows.

a) Robustness of the marking

Marking should not degrade over the intended use of the product.

b) Size

Marking should be easily recognizable and legible, either by unaided or corrected vision; however, the size of the marking is not specified.

c) Colour

Colour should be selected that provides sufficient contrast so as to be legible with mono-colour being recommended.

d) Font

OCR-A font as in ISO 1073-1, is recommended.

NOTE ISO 1073-1 Alphanumeric character sets for optical recognition Part 1: Character set OCR-A – Shapes and dimensions of the printed image

C.2.2 Marking for solder designation

Marking for solder should be made as follow.

a) Solder designation

The identification for solders shall be made by the solder short alloy name listed in Table B.1, Table B.2 and Table B.3.

b) Marking for multiple solders

If two or more solders are used in different soldering processes on the surfaces (top and bottom) of the board, it is recommended to mark all solders in use. Examples of marking are shown below:

Example:

Top reflow using A30C5; Bottom reflow using N80A35B5; Soldering iron using C7

A30C5/N80A35B5/C7 or A30C5, N80A35B5, C7

C.2.3 Marking unit and location

C.2.3.1 Marking unit

The assembled board with 10 cm^2 or larger size should have the marking when space is available.

C.2.3.2 Marking location

If possible, marking should be located on the right-hand corner of the topside of the board, or next to the board part number. Otherwise, marking shall be located on an arbitrary place available on the board. An example of marking on a board is given in Figure C.1.

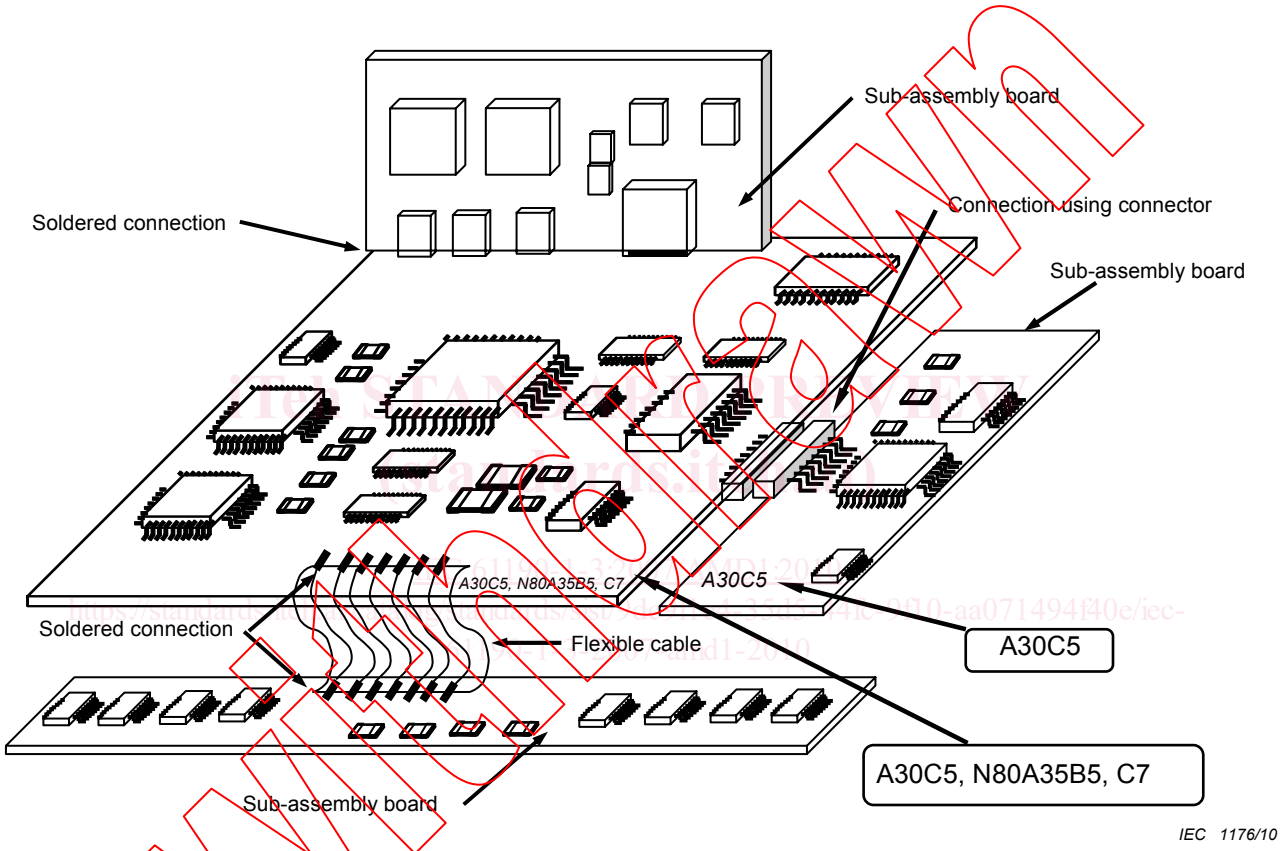

Figure C.1 – Example of the marking for assembled board

C.2.3.3 Marking in the case there are multiple boards

Where there are multiple boards in a block, the marking should be made as follows:

a) on the representative main board when the boards are soldered to one block;

b) on each board where the boards are connected, using connectors.