INTERNATIONAL STANDARD

ISO 9453

Third edition
2014-08-01

Soft solder alloys — Chemical compositions and forms

Alliages de brasage tendre — Compositions chimiques et formes

Reference number
ISO 9453:2014(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 44, *Welding*, Subcommittee SC 12, *Soldering materials*.

This third edition cancels and replaces the second edition (ISO 9453:2006), which has been technically revised.

Request for an official interpretation of technical aspects of this International Standard should be directed to the relevant secretariat of ISO/TC 44/SC 12 "Soldering materials" via the user's national standardization body; a listing of these bodies can be found at: http://www.iso.org.

Introduction

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning soft solder alloy compositions given in Table 3.

ISO takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has ensured the ISO that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO. Information may be obtained from Annex B.

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

ISO (www.iso.org/patents) maintains online databases of patents relevant to their standards. Users are encouraged to consult the databases for the most up to date information concerning patents.

Soft solder alloys — Chemical compositions and forms

1 Scope

WARNING — National or regional regulations may limit the employment of certain alloys.

This International Standard specifies the requirements for chemical composition for soft solder alloys containing two or more of tin, lead, antimony, copper, silver, bismuth, zinc, indium and/or cadmium.

An indication of the forms generally available is also included.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3677, *Filler metal for soft soldering, brazing and braze welding — Designation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
soft solder
metallic filler material which is used to join metallic parts and which has a melting temperature (liquidus) lower than that of the parts to be joined and, usually, lower than 450 °C and which wets the parent metals

3.2
batch
collection of one or more units of product, made in a single production operation

4 Chemical composition

The chemical composition of the soft solder, sampled and analysed in accordance with Clause 6, shall be as given for the appropriate material in Table 1 or Table 2.

5 Forms of delivery

5.1 General

Soft solders conforming to this International Standard shall be supplied in one of the following forms: ingot, slab, stick, bar, rod, wire, pellets, preforms, rings, spheres, ribbons, powder or soldering pastes. Solder shall be uniform in quality and free from detrimental conditions such as contamination or surface oxide that prevent melting and flow in a manner suitable for the intended application.

NOTE 1 Solders supplied in the form of rod, wire, or preforms can be supplied with or without an integral flux, subject to agreement between the supplier and the purchaser.

NOTE 2 Not all the solder compositions given in the tables are necessarily available in all the product forms listed.

5.2 Unit of product

The unit of product used for defining the requirements for the marking of soft solders varies with the form of the solder.

NOTE See Table 1.

Table 1 — Variations of unit of product with form of solder

Form of solder	Unit of product
Ingot, bar, slab, stick or rod	A single ingot, bar, slab, stick or rod
Wire or ribbon	A single coil or reel
Preforms and rings, spheres, pellets or powder	The individual packaged quantity
Powder in soldering pastes	The individual packaged quantity

6 Sampling and analysis

Pending the publication of International Standards for sampling and for methods of analysis for soft solder alloys, the methods used shall, in cases of dispute, be agreed between the supplier and the purchaser.

NOTE Preferred analysis methods are Spark-OES and AAS.

7 Marking, labelling and packaging

Each batch of solder supplied in accordance with this International Standard shall be marked with the information indicated by a cross in Table 4.

The information in Table 4 shall be applied to the product forms as follows:

a) for ingots and slabs: by stamping, or inkjet marking on the surface of each unit of product;

b) for sticks, bars, rods and wire in coil: either on a label securely attached to each unit of product, or on a label on the package in which the units of product are contained;

c) for wire or ribbon on reels: on a label on each reel;

d) for pellets, preforms, spheres, powder, soldering paste: on a label on each individually packaged quantity.

All product forms shall also be labelled with any health and safety warnings required by the relevant rules and regulations of the country of manufacture, or as specified in the order.

Table 2 — Chemical compositions of lead containing solder alloys (tin-lead, lead-tin, tin-lead-antimony, tin-lead-bismuth, tin-lead-cadmium, tin-lead-copper, tin-lead-silver, and lead-silver)

Group	Alloy No.[a]	Alloy Designation according to ISO 3677 [b]	Melting or solidus/liquidus temperature °C [c]	Chemical composition, mass fraction in % [d,e]													
				Sn	Pb	Sb	Bi	Cd	Cu	Au	In	Ag	Al	As	Fe	Ni	Zn
Tin-lead binary alloys solidus temperature 183 °C	101	Sn63Pb37	183	62,5 to 63,5	Rem	0,20	0,10	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	102	Sn63Pb37E	183	62,5 to 63,5	Rem	0,05	0,05	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	103	Sn60Pb40	183/190	59,5 to 60,5	Rem	0,20	0,10	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	104	Sn60Pb40E	183/190	59,5 to 60,5	Rem	0,05	0,05	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
Lead-tin binary alloys solidus temperature 183 °C	111	Pb50Sn50	183/215	49,5 to 50,5	Rem	0,20	0,10	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	112	Pb50Sn50E	183/215	49,5 to 50,5	Rem	0,05	0,05	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	113	Pb55Sn45	183/226	44,5 to 45,5	Rem	0,50	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	114	Pb60Sn40	183/238	39,5 to 40,5	Rem	0,50	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	115	Pb65Sn35	183/245	34,5 to 35,5	Rem	0,50	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	116	Pb70Sn30	183/255	29,5 to 30,5	Rem	0,50	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	117	Pb80Sn20	183/280	19,5 to 20,5	Rem	0,50	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
Lead-tin binary alloys solidus temperature > 183 °C	121	Pb85Sn15	226/290	14,5 to 15,5	Rem	0,50	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	122	Pb90Sn10	268/302	9,5 to 10,5	Rem	0,50	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	123	Pb95Sn5	300/314	4,5 to 5,5	Rem	0,50	0,10	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	124	Pb98Sn2	320/325	1,8 to 2,2	Rem	0,12	0,10	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001

a For information on IEC short alloy names see Table A.1.

b In the proposed revision of ISO 3677, "S-" should be deleted from the alloy designation.

c The temperatures are for information purposes and are not specified requirements for the alloy.

d All single figure limits are maximum values.

e Elements shown as "Rem" (i.e. Remainder) are calculated as differences from 100 %.

Table 2 *(continued)*

Group	Alloy No.[a]	Alloy Designation according to ISO 3677 [b]	Melting or solidus/liquidus temperature °C [c]	Chemical composition, mass fraction in % [d,e]													
				Sn	Pb	Sb	Bi	Cd	Cu	Au	In	Ag	Al	As	Fe	Ni	Zn
Tin-lead-antimony	131	Sn63Pb37Sb	183	62,5 to 63,5	Rem	0,20 to 0,50	0,10	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	132	Sn60Pb40Sb	183/190	59,5 to 60,5	Rem	0,20 to 0,50	0,10	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	133	Pb50Sn50Sb	183/216	49,5 to 50,5	Rem	0,20 to 0,50	0,10	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	134	Pb58Sn40Sb2	185/231	39,5 to 40,5	Rem	2,0 to 2,4	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	135	Pb69Sn30Sb1	185/250	29,5 to 30,5	Rem	0,5 to 1,8	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	136	Pb74Sn25Sb1	185/263	24,5 to 25,5	Rem	0,5 to 2,0	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	137	Pb78Sn20Sb2	185/270	19,5 to 20,5	Rem	0,5 to 3,0	0,25	0,005	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
Tin-lead-bismuth	141	Sn60Pb38Bi2	180/185	59,5 to 60,5	Rem	0,20	2,0 to 3,0	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	142	Pb49Sn48Bi3	178/205	47,5 to 48,5	Rem	0,20	2,5 to 3,5	0,002	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001

[a] For information on IEC short alloy names see Table A.1.

[b] In the proposed revision of ISO 3677, "S-" should be deleted from the alloy designation.

[c] The temperatures are for information purposes and are not specified requirements for the alloy.

[d] All single figure limits are maximum values.

[e] Elements shown as "Rem" (i.e. Remainder) are calculated as differences from 100 %.

Table 2 *(continued)*

Group	Alloy No.[a]	Alloy Designation according to ISO 3677 [b]	Melting or solidus/liquidus temperature °C [c]	Chemical composition, mass fraction in % [d,e]													
				Sn	Pb	Sb	Bi	Cd	Cu	Au	In	Ag	Al	As	Fe	Ni	Zn
Tin-lead-cadmium	151	Sn50Pb32Cd18	145	49,5 to 50,5	Rem	0,20	0,10	17,5 to 18,5	0,08	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
Tin-lead-copper	161	Sn60Pb39Cu1	183/190	59,5 to 60,5	Rem	0,20	0,10	0,002	1,2 to 1,6	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
	162	Sn50Pb49Cu1	183/215	49,5 to 50,5	Rem	0,20	0,10	0,002	1,2 to 1,6	0,05	0,10	0,10	0,001	0,03	0,02	0,01	0,001
Tin-lead-silver	171	Sn62Pb36Ag2	179	61,5 to 62,5	Rem	0,20	0,10	0,002	0,08	0,05	0,10	1,8 to 2,2	0,001	0,03	0,02	0,01	0,001
Lead-silver	181	Pb98Ag2	304/305	0,25	Rem	0,20	0,10	0,002	0,08	0,05	0,10	2,0 to 3,0	0,001	0,03	0,02	0,01	0,001
	182	Pb95Ag5	304/370	0,25	Rem	0,20	0,10	0,002	0,08	0,05	0,10	5,0 to 6,0	0,001	0,03	0,02	0,01	0,001
Lead-silver-tin	191	Pb93Sn5Ag2	296/301	4,8 to 5,2	Rem	0,20	0,10	0,002	0,08	0,05	0,10	1,2 to 1,8	0,001	0,03	0,02	0,01	0,001

a For information on IEC short alloy names see Table A.1.

b In the proposed revision of ISO 3677, "S-" should be deleted from the alloy designation.

c The temperatures are for information purposes and are not specified requirements for the alloy.

d All single figure limits are maximum values.

e Elements shown as "Rem" (i.e. Remainder) are calculated as differences from 100 %.

Table 3 — Chemical compositions of lead-free solder alloys (tin-antimony, tin-bismuth, tin-copper, tin-indium, tin-silver and more complex compositions)

Group	Alloy No. [a]	Alloy Designation	Melting or solidus/ liquidus temperature °C [b]	Chemical composition, mass fraction in % [c,d]														
				Sn	Pb[e]	Sb	Bi	Cu	Au	In	Ag	Al	As	Cd	Fe	Ni	Zn	Other Elements
Tin-antimony	201	Sn95Sb5	235/240	Rem	0,07	4,5 to 5,5	0,10	0,05	0,05	0,10	0,10	0,001	0,03	0,002	0,02	0,01	0,001	
Bismuth-tin	301	Bi58Sn42	139	41 to 43	0,07	0,10	Rem	0,05	0,05	0,10	0,10	0,001	0,03	0,002	0,02	0,01	0,001	
Tin-bismuth-copper-indium	302	Sn96,9Bi1,7Cu0,8In0,6	217/218	Rem	0,07	0,10	1,5 to 1,9	0,5 to 0,9	0,05	0,4 to 0,8	0,10	0,001	0,03	0,002	0,02	0,01	0,001	P 0,01 to 0,1
Tin-copper	401	Sn99,3Cu0,7	227	Rem	0,07	0,10	0,10	0,5 to 0,9	0,05	0,10	0,10	0,001	0,03	0,002	0,02	0,01	0,001	
	402	Sn97Cu3	227/310	Rem	0,07	0,10	0,10	2,5 to 3,5	0,05	0,10	0,10	0,001	0,03	0,002	0,02	0,01	0,001	
Tin-copper-nickel	403	Sn99,25Cu0,7Ni0,05	227	Rem	0,07	0,10	0,10	0,5 to 0,9	0,05	0,10	0,10	0,001	0,03	0,002	0,02	0,02 to 0,08	0,001	
Tin-copper-nickel-phospho-rus-gallium	409	Sn98,95Cu0,7Ni0,25P0,05Ga0,05	214/220	Rem	0,07	0,10	0,10	0,5 to 0,9	0,05	0,10	0,10	0,001	0,03	0,002	0,02	0,01 to 0,25	0,001	P 0,01 - 0,1 Ga 0,01 - 0,1

[a] For information on IEC short alloy names see Annex A.

[b] The temperatures given under the heading "Melting or solidus/liquidus temperature" are for information purposes and are not specified requirements for the alloys.

[c] All single figure limits are maximum values as impurities. Ranges are given for alloying elements.

[d] Elements shown as "Rem" (i.e. Remainder) are calculated as differences from 100 %.

[e] Lead figure of up to 0,10 % may be used in applications not affected by existing legislation which requires lower lead levels, where agreed between purchaser and supplier. For special applications can be a lower lead content necessary based on legal requirements.

Table 3 *(continued)*

Group	Alloy No. [a]	Alloy Designation	Melting or solidus/ liquidus temperature °C [b]	Chemical composition, mass fraction in % [c,d]														
				Sn	Pb[e]	Sb	Bi	Cu	Au	In	Ag	Al	As	Cd	Fe	Ni	Zn	Other Elements
Tin-copper-silver	501	Sn99Cu0,7Ag0,3	217/227	Rem	0,07	0,10	0,06	0,5 to 0,9	0,05	0,10	0,2 to 0,4	0,001	0,03	0,002	0,02	0,01	0,001	
	502	Sn95Cu4Ag1	217/353	Rem	0,07	0,10	0,08	3,5 to 4,5	0,05	0,10	0,8 to 1,2	0,001	0,03	0,002	0,02	0,01	0,001	
	503	Sn92Cu6Ag2	217/380	Rem	0,07	0,10	0,08	5,5 to 6,5	0,05	0,10	1,8 to 2,2	0,001	0,03	0,002	0,02	0,01	0,001	
Tin-copper-silver-phosphorus-Gallium	504	Sn99,1Cu0,5Ag0,3P0,05Ga0,05	217/224	Rem	0,07	0,10	0,08	0,3 to 0,7	0,05	0,10	0,2 to 0,4	0,001	0,03	0,002	0,02	0,01	0,001	P 0,01 - 0,1 Ga 0,01 - 0,1
Indium-tin	601	In52Sn48	118	47,5 to 48,5	0,07	0,10	0,10	0,05	0,05	Rem	0,10	0,001	0,03	0,002	0,02	0,01	0,001	
Tin-indium-silver-bismuth	611	Sn88In8Ag3,5Bi0,5	197/208	Rem	0,07	0,10	0,3 to 0,7	0,05	0,05	7,5 to 8,5	3,2 to 3,8	0,001	0,03	0,002	0,02	0,01	0,001	
	612	Sn92In4Ag3,5Bi0,5	210/215	Rem	0,07	0,10	0,3 to 0,7	0,05	0,05	3,5 to 4,5	3,2 to 3,8	0,001	0,03	0,002	0,02	0,01	0,001	

[a] For information on IEC short alloy names see Annex A.

[b] The temperatures given under the heading "Melting or solidus/liquidus temperature" are for information purposes and are not specified requirements for the alloys.

[c] All single figure limits are maximum values as impurities. Ranges are given for alloying elements.

[d] Elements shown as "Rem" (i.e. Remainder) are calculated as differences from 100 %.

[e] Lead figure of up to 0,10 % may be used in applications not affected by existing legislation which requires lower lead levels, where agreed between purchaser and supplier. For special applications can be a lower lead content necessary based on legal requirements.

Table 3 *(continued)*

Group	Alloy No. [a]	Alloy Designation	Melting or solidus/ liquidus tempera-ture °C [b]	Chemical composition, mass fraction in % [c,d]														
				Sn	Pb[e]	Sb	Bi	Cu	Au	In	Ag	Al	As	Cd	Fe	Ni	Zn	Other Ele-ments
Tin-silver	701	Sn96,3Ag3,7	221/228	Rem	0,07	0,10	0,10	0,05	0,05	0,10	3,5 to 3,9	0,001	0,03	0,002	0,02	0,01	0,001	
	702	Sn97Ag3	221/224	Rem	0,07	0,10	0,10	0,05	0,05	0,10	2,8 to 3,2	0,001	0,03	0,002	0,02	0,01	0,001	
	703	Sn96,5Ag3,5	221	Rem	0,07	0,10	0,10	0,05	0,05	0,10	3,3 to 3,7	0,001	0,03	0,002	0,02	0,01	0,001	
	704	Sn95Ag5	221/240	Rem	0,07	0,10	0,10	0,05	0,05	0,10	4,8 to 5,2	0,001	0,03	0,002	0,02	0,01	0,001	

[a] For information on IEC short alloy names see Annex A.

[b] The temperatures given under the heading "Melting or solidus/liquidus temperature" are for information purposes and are not specified requirements for the alloys.

[c] All single figure limits are maximum values as impurities. Ranges are given for alloying elements.

[d] Elements shown as "Rem" (i.e. Remainder) are calculated as differences from 100 %.

[e] Lead figure of up to 0,10 % may be used in applications not affected by existing legislation which requires lower lead levels, where agreed between purchaser and supplier. For special applications can be a lower lead content necessary based on legal requirements.

Table 3 *(continued)*

Group	Alloy No. [a]	Alloy Designation	Melting or solidus/ liquidus temperature °C [b]	Chemical composition, mass fraction in % [c,d]														
				Sn	Pb[e]	Sb	Bi	Cu	Au	In	Ag	Al	As	Cd	Fe	Ni	Zn	Other Elements
Tin-silver-copper	711	Sn96,5Ag3Cu0,5	217/220	Rem	0,07	0,10	0,10	0,3 to 0,7	0,05	0,10	2,8 to 3,2	0,001	0,03	0,002	0,02	0,01	0,001	
	712	Sn95,8Ag3,5Cu0,7	217/218	Rem	0,07	0,10	0,10	0,5 to 0,9	0,05	0,10	3,3 to 3,7	0,001	0,03	0,002	0,02	0,01	0,001	
	713	Sn95,5Ag3,8Cu0,7	217	Rem	0,07	0,10	0,10	0,5 to 0,9	0,05	0,10	3,6 to 4,0	0,001	0,03	0,002	0,02	0,01	0,001	
	714	Sn95,5Ag4Cu0,5	217/219	Rem	0,07	0,10	0,10	0,3 to 0,7	0,05	0,10	3,8 to 4,2	0,001	0,03	0,002	0,02	0,01	0,001	
	715	Sn98,3Ag1Cu0,7	217/224	Rem	0,07	0,10	0,10	0,5 to 0,9	0,05	0,10	0,8 to 1,2	0,001	0,03	0,002	0,02	0,01	0,001	
Tin-silver-copper	716	Sn98,5Ag1Cu0,5	217/227	Rem	0,07	0,10	0,10	0,3 to 0,7	0,05	0,10	0,8 to 1,2	0,001	0,03	0,002	0,02	0,01	0,001	
Tin-silver-copper-indium	731	Sn97,8Ag1,2Cu0,5In0,5	217/225	Rem	0,07	0,10	0,10	0,3 to 0,7	0,05	0,2 to 0,8	1,0 to 1,4	0,001	0,03	0,002	0,02	0,01	0,001	
Tin-silver-copper-nickel-germanium	741	Sn95,92-Ag3,5Cu0,5Ni0,07Ge0,01	217/219	Rem	0,07	0,10	0,10	0,3 to 0.7	0,05	0,10	3,3 to 3,7	0,001	0,03	0,002	0,02	0,06 to 0,08	0,001	Ge 0,005 -0,015

[a] For information on IEC short alloy names see Annex A.

[b] The temperatures given under the heading "Melting or solidus/liquidus temperature" are for information purposes and are not specified requirements for the alloys.

[c] All single figure limits are maximum values as impurities. Ranges are given for alloying elements.

[d] Elements shown as "Rem" (i.e. Remainder) are calculated as differences from 100 %.

[e] Lead figure of up to 0,10 % may be used in applications not affected by existing legislation which requires lower lead levels, where agreed between purchaser and supplier. For special applications can be a lower lead content necessary based on legal requirements.

Table 3 *(continued)*

Group	Alloy No. [a]	Alloy Designation	Melting or solidus/ liquidus tempera-ture °C [b]	Chemical composition, mass fraction in % [c,d]														
				Sn	Pb[e]	Sb	Bi	Cu	Au	In	Ag	Al	As	Cd	Fe	Ni	Zn	Other Ele-ments
Tin-silver-bismuth-copper	721	Sn96Ag2,5Bi1Cu0,5	213/218	Rem	0,07	0,10	0,8 to 1,2	0,3 to 0,7	0,05	0,10	2,3 to 2,7	0,001	0,03	0,002	0,02	0,01	0,001	
Tin-zinc	801	Sn91Zn9	199	Rem	0,07	0,10	0,10	0,05	0,05	0,10	0,10	0,001	0,03	0,002	0,02	0,01	8,5 to 9,5	
Tin-zinc-bismuth	811	Sn89Zn8Bi3	190/197	Rem	0,07	0,10	2,8 to 3,2	0,05	0,05	0,10	0,10	0,001	0,03	0,002	0,02	0,01	7,5 to 8,5	

[a] For information on IEC short alloy names see Annex A.

[b] The temperatures given under the heading "Melting or solidus/liquidus temperature" are for information purposes and are not specified requirements for the alloys.

[c] All single figure limits are maximum values as impurities. Ranges are given for alloying elements.

[d] Elements shown as "Rem" (i.e. Remainder) are calculated as differences from 100 %.

[e] Lead figure of up to 0,10 % may be used in applications not affected by existing legislation which requires lower lead levels, where agreed between purchaser and supplier. For special applications can be a lower lead content necessary based on legal requirements.

Table 4 — Marking requirements for soft solders

Mark	Ingots	Slabs	Sticks	Bars	Rods	Wire	Ribbon	Pellets	Preforms	Powder	Sodering paste	Spheres
Alloy number or alloy designation	X	X	X	X	X	X	X	X	X	X	X	X
Batch No.	X	X	X	X	X	X	X	X	X	X	X	X
Date of manufacture	—	—	—	—	—	—	—	—	X	X	X	X
Storage conditions	—	—	—	—	—	—	—	—	X	X	X	X
Mass and quantity (where applicable)	—	—	—	—	—	X	X	X	X	X	X	X
Manufacturer's name or trade mark	—	—	—	—	—	X	X	X	X	X	X	X

Annex A
(informative)

Comparison between alloy numbers in ISO 9453 and short names and chemical compositions according to IEC 61190-1-3

Table A.1 — Comparison between alloy numbers in ISO 9453 and short names and chemical compositions according to IEC 61190–1-3

Alloy name	ISO 9453 Alloy number	IEC 61190–1-3 Short name	Sn %	Cu %	Bi %	In %	Ag %	Sb %	Other component elements	Temperature [a] °C	
										Solidus	Liquidus
Sn100	—	Sn100	99,9	—	—	—	—	—	—	232	mp[b]
Sn97Ag3	702	A30	Rem-97,0	—	—	—	3,0	—	—	221	224
Sn96,5Ag3,5	703	A35	Rem-96,5	—	—	—	3,5	—	—	221	ea[c]
Sn96,3Ag3,7	701	A37	Rem-96,3	—	—	—	3,7	—	—	221	228
Sn99,3Cu0,7	401	C7	Rem-99,3	0,7	—	—	—	—	—	227	ea[c]
Sn99Cu0,7Ag0,3	501	C7A3	Rem-99,0	0,7	—	—	0,3 ± 0,1	—	—	217	227
Sn98,97Cu0,7Ag0,3Ni0,03	505	C7A3Ni	Rem-98,97	0,7	—	—	0,3 ± 0,1	—	Ni 0,03 ± 0,01	218	228
Sn98,3Cu0,7Ag1	715	C7A10	Rem-98,3	0,7	—	—	1,0	—	—	217	224
Sn95Cu4Ag1	502	C40A10	Rem-95,0	4,0 ± 0,5	—	—	1,0	—	—	217	353
Sn92Cu6Ag2	503	C60A20	Rem-92,0	6,0	—	—	2,0	—	—	217	380
Sn96,5Ag3Cu0,5	711	A30C5	Rem-96,5	0,5	—	—	3,0	—	—	217	220
Sn95,8Ag3,5Cu0,7	712	A38C07	Rem-95,8	0,7	—	—	3,5	—	—	217	218
Sn95,5Ag3,8Cu0,7	713	A38C7	Rem-95,5	0,7	—	—	3,8	—	—	217	226
Sn95,5Ag4,0Cu0,5	714	A40C5	Rem-95,5	0,5	—	—	4,0	—	—	217	229
Sn96Ag2,5Bi1Cu0,5	721	A25B10C5	Rem-96,0	0,5	1,0	—	2,5	—	—	213	218
Bi58Sn42	301	B580	Rem-42,0	—	58,0	—	—	—	—	139	ea[c]
Sn97Cu3	402	C30	REM-97,0	3,0	—	—	—	—	—	227	310
In52Sn48	601	N520	REM-48,0	—	—	52,0	—	—	—	118	ea[c]
Sn88In8Ag3,5Bi0,5	611	N80A35B5	REM-88,0	—	0,5	8,0	3,5	—	—	196	206
Sn92In4Ag3,5Bi0,5	612	N40A35B5	REM-92,0	—	0,5	4,0	3,5	—	—	210	216

[a] Melting temperature in accordance with IEC 61190–1-3.

[b] Melting point.

[c] Eutectic (alloy).