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Brazing — Filler metals

Brasage fort — Métaux d'apport

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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 (see 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 (see 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 and allied processes*.

This second edition cancels and replaces the first edition (ISO 17672:2010), which has been technically revised.

Requests for official interpretations of any aspect of this International Standard should be directed to the Secretariat of ISO/TC 44 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Brazing — Filler metals

1 Scope

This International Standard specifies the compositional ranges of a series of filler metals used for brazing. The filler metals are divided into seven classes, related to their composition, but not necessarily to the major element present.

NOTE 1 For the major element(s) present, see Annex A.

In the case of composite products, such as flux-coated rods, pastes or plastics tapes, this International Standard covers only the filler metal that forms parts of such products. The melting temperatures given in the tables are only approximate, as they necessarily vary within the compositional range of the filler metal. Therefore, they are given only for information. Technical delivery conditions are given for brazing filler metals and products containing brazing filler metals with other constituents such as flux and/or binders.

NOTE 2 For some applications, e.g. precious metal jewellery, aerospace and dental, filler metals other than those included in this International Standard are often used and these are covered by other International Standards to which reference can be made.

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 and braze welding — Designation*

ISO 80000-1:2009, *Quantities and units — Part 1: General*

3 Composition

The filler metal shall have a composition in accordance with Tables 5 to 13 for the particular type, except as modified for special vacuum requirements (see Clause 4 and Table 1).

If the values for an element range from 0 (—) to a defined value, the element may be, but does not have to be, in that brazing filler metal.

For the purposes of determining compliance with composition limits, any value obtained from the analysis shall be rounded to the same number of decimal places as used in this International Standard in expressing the specified limit. The following rules shall be used for rounding.

a) When the figure immediately after the last figure to be retained is less than five, then the last figure to be retained shall be kept unchanged.

b) When the figure immediately after the last figure to be retained is either

   1) greater than five, or

   2) equal to five and followed by at least one figure other than zero,

   the last figure to be retained shall be increased by one.

c) When the figure immediately after the last figure to be retained is equal to five, and followed by zeros only, then the last figure to be retained shall be left unchanged if even, and increased by one

if odd. For the purposes of determining compliance with the requirements of this International Standard, the actual test values obtained shall be subjected to the rounding-off instructions given in ISO 80000-1:2009, Annex B.

NOTE The chemical analysis is of the bulk material, but the material can be composed of discrete powders with different individual compositions or multiple layers of roll-clad foils where each layer can have a different individual composition.

4 Special vacuum requirement

In a few instances, which are most likely to apply to Ag 272, Pd 287, Pd 387, Pd 388, Pd 481, Pd 483, Pd 484, Pd 587, Pd 647 and Au 295, Au 375, Au 625, Au 752, Au 801 and Au 827, lower impurity limits can be required for brazing in vacuum or service in vacuum and these limits shall be as given in Table 1.

Filler metals complying with Table 1 shall have the letter V added as a suffix to the codification plus the digit 1 or 2 to indicate the grade.

NOTE Grade 1 is intended for the most demanding duties, Grade 2 for less demanding.

Table 1 — Impurity limits for special vacuum requirements

Impurity	Limit % by mass max.	
	Grade 1	Grade 2
C[a]	0,005	0,005
Cd	0,001	0,002
P	0,002	0,002[b]
Pb	0,002	0,002
Zn	0,001	0,002
Mn[c]	0,001	0,002
In[c]	0,002	0,003
All other elements where vapour pressure at 500 °C is > $1{,}3 \times 10^{-5}$ Pa[d]	0,001	0,002

[a] For filler metal Ag 272 (see Table 6), lower levels may be available by agreement between the purchaser and the supplier.

[b] For filler metal Ag 272, 0,02 % maximum.

[c] Except where otherwise specified in Tables 5 to 13.

[d] Examples of such elements are Ca, Cs, K, Li, Mg, Na, Rb, S, Sb, Se, Sr, Te and Tl. For such elements (including Cd, Pb and Zn), the total is limited to 0,010 %.

5 Chemical analysis

Chemical analyses shall be carried out by any suitable method, but it should be noted that in the case of many brazing alloys, the use of reference standards may be essential, as agreed between the purchaser and the supplier. Analysis is only required to be carried out routinely for those elements for which specific limits are shown. If, however, the presence of other elements is suspected or in the course of routine analysis is indicated to be in excess of the limits laid down for unnamed elements, or would bring the total of impurities above the specified limit, further analyses shall be carried out for such elements.

6 Designation

The filler metal shall be designated by the description "filler metal," reference to this International Standard (i.e. ISO 17672) and a code. Details of the two options for the code system used are given in Annex A.

As an example, the designations of an aluminium filler metal containing 11 % to 13 % Si, in accordance with this International Standard, can be made in one of the following ways:

EXAMPLE 1 Filler metal ISO 17672-Al 112

where

"Filler metal" is the description;

"ISO 17672" is the reference to this International Standard;

"Al 112" is the short code given in Tables 5 to 13.

EXAMPLE 2 Filler metal ISO 17672-B-Al88Si-575/585

where

"Filler metal" is the description;

"ISO 17672" is the reference to this International Standard;

"B" denotes brazing;

"Al88Si-575/585" is the code in accordance with ISO 3677.

7 Technical delivery conditions

7.1 Types of product

The form of the material shall be agreed between the purchaser and the manufacturer/supplier at the time of placing the order.

NOTE Brazing filler metals are available as rod, wire, foil (or preforms made from them) or powder, although not all filler metals are necessarily available in every type of product. They are also available as a constituent of brazing pastes or, particularly in the case of aluminium brazing filler metals, clad onto one or both sides of an alloy sheet. Rods can be completely or partially coated with flux.

7.2 Dimensions

7.2.1 General

Dimensions and tolerances for foils (see 7.2.2), rods (see 7.2.3) and, to a lesser extent, wires (see 7.2.4) are defined. For other forms and dimensions not listed in the respective tables, the purchaser and the manufacturer/supplier shall agree on the dimensions and tolerances at the time of placing the order.

7.2.2 Foils

The tolerances for thickness, width and camber are given in Tables 2, 3 and 4.

Table 2 — Thickness tolerance for foils

Thickness nominal size mm		Limits of thickness related to width over 1 mm (nominal size)
over	to	
—	0,05	±10 %
0,05	0,1	±0,005 mm
0,1	0,2	±0,010 mm
0,2	0,3	±0,015 mm
0,3	0,4	±0,018 mm
0,4	0,5	±0,020 mm
0,5	0,8	±0,025 mm
0,8	1,2	±0,030 mm
1,2	2,0	±0,035 mm

Table 3 — Width tolerance for foils

Thickness nominal size mm		Limits of width related to width (nominal size) mm		
over	to	to 50 mm	over 50 mm to 100 mm	over 100 mm
—	0,1	$^{+0,2}_{0}$	$^{+0,3}_{0}$	$^{+0,4}_{0}$
0,1	1,0	$^{+0,2}_{0}$	$^{+0,3}_{0}$	$^{+0,4}_{0}$
1,0	2,0	$^{+0,3}_{0}$	$^{+0,4}_{0}$	$^{+0,5}_{0}$

Table 4 — Camber tolerance for foils

Thickness nominal size mm		Max. camber for width nominal size mm/m				
over	to	from 3 mm to 10 mm	over 10 mm to 15 mm	over 15 mm to 30 mm	over 30 mm to 50 mm	over 50 mm
—	0,5	10	7	4	3	3
0,5	2,0	15	10	6	4	4

7.2.3 Rods

For rods, the preferred diameters are 1 mm, 1,5 mm, 2 mm, 2,5 mm, 3 mm and 5 mm and the preferred lengths are 500 mm and 1 000 mm. The tolerance on diameter shall be ±3 % for drawn rods and ±0,3 mm for other fabrication processes. The tolerance on length shall be ±5 mm.

7.2.4 Wires

For wires, there are no preferred diameters and the tolerance on diameter shall be ±3 %.

7.3 Condition

The surface of brazing filler metals shall be free from contamination which could adversely affect brazing. With flux-coated rods, the coating shall firmly adhere to the rod and shall not break off during proper handling and usage. Welds, when present, shall have been made so as not to interfere with uniform, uninterrupted feeding of filler metal on automatic and semiautomatic brazing.

7.4 Marking

Since in many cases the marking of brazing filler metals themselves is impracticable, reliance shall be placed on the marking of packets. The outside of each smallest unit package shall be clearly marked with the following information:

a) the designation in accordance with Clause 6;

b) the name of the manufacturer/supplier;

c) the trade name (if any);

d) the quantity of material and, if applicable, the dimensions;

e) the supplier's batch number;

f) health and safety warnings (as required by national regulations).

7.5 Packaging

Brazing filler metals or products containing them shall be packed to provide sufficient safeguard against damage and deterioration during transportation and storage.

7.6 Product certificates

If certificates (like those specified in ISO 14344) of conformity and/or analysis are required, the purchaser and the manufacturer/supplier shall agree on the details at the time of placing the order.

8 Metal hazards

Although not directly relevant to the requirements of this International Standard, any national requirements for limiting exposure to metal hazards, e.g. fume, should be observed. This is particularly important when using brazing filler metals containing cadmium as an alloying element.

Table 5 — Class Al: aluminium and magnesium brazing filler metals

Code	Composition % by mass										Melting temperature (approximate)	
	Si	Fe	Cu	Mn	Mg	Zn	Others	Non-defined elements		Al		
								Each	Total		Solidus	Liquidus
	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	max.	max.	min./max.	°C	°C
Al-Si alloys												
Al 105	4,5/6,0	—/0,6	—/0,30	—/0,15	—/0,20	—/0,10	Ti: —/0,15	0,05	0,15	Remainder	575	630
Al 107	6,8/8,2	—/0,8	—/0,25	—/0,10	—/—	—/0,20	—/—	0,05	0,15	Remainder	575	615
Al 110	9,0/11,0	—/0,8	—/0,30	—/0,05	—/0,05	—/0,10	Ti: —/0,20	0,05	0,15	Remainder	575	590
Al 112	11,0/13,0	—/0,8	—/0,30	—/0,15	—/0,10	—/0,20	—/—	0,05	0,15	Remainder	575	585
Al-Si-Cu alloys												
Al 210	9,3/10,7	—/0,8	3,3/4,7	—/0,15	—/0,15	—/0,20	Cr: —/0,15	0,05	0,15	Remainder	520	585
Al-Si-Mg alloys												
Al 310	9,0/10,5	—/0,8	—/0,25	—/0,10	1,0/2,0	—/0,20	—/—	0,05	0,15	Remainder	555	590
Al 311	9,0/10,5	—/0,8	—/0,25	—/0,10	1,0/2,0	—/0,20	Bi: 0,02/0,20	0,05	0,15	Remainder	555	590
Al 315	9,5/11,0	—/0,8	—/0,25	—/0,10	0,20/1,0	—/0,20	—/—	0,05	0,15	Remainder	559	591
Al 317	11,0/13,0	—/0,8	—/0,25	—/0,10	0,10/0,50	—/0,20	—/—	0,05	0,15	Remainder	562	582
Al 319	10,5/13,0	—/0,8	—/0,25	—/0,10	1,0/2,0	—/0,20	—/—	0,05	0,15	Remainder	559	579
Al-Si-Zn alloys												
Al 410	9,0/11,0	—/0,8	—/0,3	—/0,05	—/0,05	0,50/3,0	—/—	0,05	0,15	Remainder	576	588
Al 415	6,8/8,2	—/0,8	—/0,25	—/0,10	—/—	0,50/3,0	—/—	0,05	0,15	Remainder	576	609
Mg alloys												
Mg 001	—/0,05	—/0,005	—/0,05	0,15/1,5	Remainder	1,7/2,3	Be: 0,0002/0,0008 Ni: —/0,005	0,05	0,30	8,3/9,7	443	599
Maximum impurity limits applicable to all types are (% by mass) Cd 0,010 and Pb 0,025.												

Table 6 — Class Ag: silver brazing filler metals

Code	Composition % by mass								Melting temperature (approximate)	
	Ag min./ max.	Cu min./ max.	Zn min./ max.	Cd min./ max.	Sn min./ max.	Ni min./ max.	Mn min./ max.	Others min./max.	Solidus °C	Liquidus °C
Ag-Cu-Zn-Sn alloys										
Ag 125	24,0/26,0	39,0/41,0	31,0/35,0	—/—	1,5/2,5	—/—	—/—	—/—	680	760
Ag 130	29,0/31,0	35,0/37,0	30,0/34,0	—/—	1,5/2,5	—/—	—/—	—/—	665	755
Ag 134	33,0/35,0	35,0/37,0	25,5/29,5	—/—	2,0/3,0	—/—	—/—	—/—	630	730
Ag 138	37,0/39,0	31,0/33,0	26,0/30,0	—/—	1,5/2,5	—/—	—/—	—/—	650	720
Ag 140	39,0/41,0	29,0/31,0	26,0/30,0	—/—	1,5/2,5	—/—	—/—	—/—	650	710
Ag 145	44,0/46,0	26,0/28,0	23,5/27,5	—/—	2,0/3,0	—/—	—/—	—/—	640	680
Ag 155	54,0/56,0	20,0/22,0	20,0/24,0	—/—	1,5/2,5	—/—	—/—	—/—	630	660
Ag 156	55,0/57,0	21,0/23,0	15,0/19,0	—/—	4,5/5,5	—/—	—/—	—/—	620	655
Ag 160	59,0/61,0	29,0/31,0	—/—	—/—	9,5/10,5	—/—	—/—	—/—	600	730
Ag-Cu-Zn alloys										
Ag 205	4,0/6,0	54,0/56,0	38,0/42,0	—/—	—/—	—/—	—/—	Si: 0,05/0,25	820	870
Ag 212	11,0/13,0	47,0/49,0	38,0/42,0	—/—	—/—	—/—	—/—	Si: 0,05/0,25	800	830
Ag 220	19,0/21,0	43,0/45,0	34,0/38,0	—/—	—/—	—/—	—/—	Si: 0,05/0,25	690	810
Ag 225	24,0/26,0	39,0/41,0	33,0/37,0	—/—	—/—	—/—	—/—	—/—	700	790
Ag 230	29,0/31,0	37,0/39,0	30,0/34,0	—/—	—/—	—/—	—/—	—/—	680	765
Ag 230[a]	29,0/31,0	35,0/37,0	29,5/34,0	—/—	—/—	2,0/2,5	—/—	Si: 0,05/0,15	675	790
Ag 235	34,0/36,0	31,0/33,0	31,0/35,0	—/—	—/—	—/—	—/—	—/—	685	755
Ag 244	43,0/45,0	29,0/31,0	24,0/28,0	—/—	—/—	—/—	—/—	—/—	675	735
Ag 245	44,0/46,0	29,0/31,0	23,0/27,0	—/—	—/—	—/—	—/—	—/—	665	745
Ag 250	49,0/51,0	33,0/35,0	14,0/18,0	—/—	—/—	—/—	—/—	—/—	690	775
Ag 265	64,0/66,0	19,0/21,0	13,0/17,0	—/—	—/—	—/—	—/—	—/—	670	720
Ag 270	69,0/71,0	19,0/21,0	8,0/12,0	—/—	—/—	—/—	—/—	—/—	690	740
Ag 272[a]	71,0/73,0	27,0/29,0	—/—	—/—	—/—	—/—	—/—	—/—	780	780
Ag-Cu-Zn-Cd alloys										
Ag 326	24,0/26,0	29,0/31,0	25,5/29,5	16,5/18,5	—/—	—/—	—/—	—/—	605	720
Ag 330	29,0/31,0	27,0/29,0	19,0/23,0	19,0/23,0	—/—	—/—	—/—	—/—	600	690
Ag 335	34,0/36,0	25,0/27,0	19,0/23,0	17,0/19,0	—/—	—/—	—/—	—/—	610	700
Ag 340	39,0/41,0	18,0/20,0	19,0/23,0	18,0/22,0	—/—	—/—	—/—	—/—	595	630
Ag 345	44,0/46,0	14,0/16,0	14,0/18,0	23,0/25,0	—/—	—/—	—/—	—/—	605	620
Ag 350	49,0/51,0	14,5/16,5	14,5/18,5	17,0/19,0	—/—	—/—	—/—	—/—	620	640
Ag 351	49,0/51,0	14,5/16,5	13,5/17,5	15,0/17,0	—/—	2,5/3,5	—/—	—/—	635	655
Ag-Cu-Zn-Ni-Mn alloys										
Ag 425	24,0/26,0	37,0/39,0	31,0/35,0	—/—	—/—	1,5/2,5	1,5/2,5	—/—	705	800

Maximum impurity limits applicable to all types are (% by mass) Al 0,001, Bi 0,030, Cd 0,010, P 0,008, Pb 0,025; Si 0,05; total of all impurities = 0,15; total of all impurities for Ag 427, Ag 449 and Ag 485 = 0,30.

If Si is intentionally added to all alloys of Table 6, the range shall be between 0,05 and 0,25 (% by mass).

The filler metals then have to be designated additionally by description Si at the end. For example: Filler metal ISO 17672-Ag 155Si or Filler metal ISO 17672-B-Ag55ZnCuSn(Si)-630/660.

[a] For special vacuum applications, see Table 1.

Table 6 *(continued)*

Code	Composition % by mass								Melting temperature (approximate)	
	Ag min./ max.	Cu min./ max.	Zn min./ max.	Cd min./ max.	Sn min./ max.	Ni min./ max.	Mn min./ max.	Others min./max.	Solidus °C	Liquidus °C
Ag 427	26,0/28,0	37,0/39,0	18,0/22,0	—/—	—/—	5,0/6,0	8,5/10,5	—/—	680	830
Ag 440	39,0/41,0	29,0/31,0	26,0/30,0	—/—	—/—	1,5/2,5	—/—	—/—	670	780
Ag 449	48,0/50,0	15,0/17,0	21,0/25,0	—/—	—/—	4,0/5,0	7,0/8,0	—/—	680	705
Ag 450	49,0/51,0	19,0/21,0	26,0/30,0	—/—	—/—	1,5/2,5	—/—	—/—	660	705
Ag 454	53,0/55,0	37,5/42,5	4,0/6,0	—/—	—/—	0,5/1,5	—/—	—/—	720	855
Ag 456	55,0/57,0	41,0/43,0	—/—	—/—	—/—	1,5/2,5	—/—	—/—	770	895
Ag 456[a]	55,0/57,0	26,25/28,25	—/—	—/—	—/—	2,0/2,5		In: 13,5/15,5	600	710
Ag 463	62,0/64,0	27,5/29,5	—/—	—/—	5,0/7,0	2,0/3,0	—/—	—/—	690	800
Ag 485	84,0/86,0	—/—	—/—	—/—	—/—	—/—	14,0/16,0	—/—	960	970

Maximum impurity limits applicable to all types are (% by mass) Al 0,001, Bi 0,030, Cd 0,010, P 0,008, Pb 0,025; Si 0,05; total of all impurities = 0,15; total of all impurities for Ag 427, Ag 449 and Ag 485 = 0,30.

If Si is intentionally added to all alloys of Table 6, the range shall be between 0,05 and 0,25 (% by mass).

The filler metals then have to be designated additionally by description Si at the end. For example: Filler metal ISO 17672-Ag 155Si or Filler metal ISO 17672-B-Ag55ZnCuSn(Si)-630/660.

[a] For special vacuum applications, see Table 1.

Table 7 — Class CuP: copper-phosphorus brazing filler metals

Code	Composition % by mass				Melting temperature (approximate)	
	Cu	P min./max.	Ag min./max.	Other min./max.	Solidus °C	Liquidus[a] °C
Cu P alloys						
CuP 178	Remainder	4,8/5,3	—/—	—/—	710	925
CuP 179	Remainder	5,9/6,5	—/—	—/—	710	890
CuP 180	Remainder	6,6/7,4	—/—	—/—	710	820
CuP 181	Remainder	7,0/7,5	—/—	—/—	710	793
CuP 182	Remainder	7,5/8,1	—/—	—/—	710	770
Ag-Cu-P alloys						
CuP 279	Remainder	5,9/6,7	1,5/2,5	—/—	645	825
CuP 280	Remainder	6,8/7,2	1,8/2,2	—/—	645	788
CuP 281	Remainder	5,8/6,2	4,8/5,2	—/—	645	815
CuP 281[a]	Remainder	5,7/6,3	4,5/5,5	—/—	645	815
CuP 282	Remainder	6,5/7,0	4,8/5,2	—/—	645	771
CuP 283	Remainder	7,0/7,5	5,8/6,2	—/—	645	720

Maximum impurity limits applicable to all types are (% by mass) Al 0,01, Bi 0,030, Cd 0,010, Pb 0,025, Zn 0,05, Zn + Cd 0,05; total of all impurities = 0,25.

If Si is intentionally added to all alloys of Table 7, the range shall be between 0,05 and 0,25 (% by mass).

The filler metals then have to be designated additionally by description Si at the end. For example: Filler metal ISO 17672-CuP 279Si or Filler metal ISO 17672-B-Cu92PAg(Si)-645/825.

These filler metals should never be used on ferrous metals, nickel alloys or copper alloys containing nickel.

[a] Unlike the majority of filler metals in this International Standard, which only flow satisfactorily at, around or above the liquidus, most copper phosphorus filler metals are sufficiently fluid for brazing at a temperature significantly below the liquidus.

Table 7 *(continued)*

Code	Composition % by mass				Melting temperature (approximate)	
	Cu	P min./max.	Ag min./max.	Other min./max.	Solidus °C	Liquidus[a] °C
CuP 283[a]	Remainder	7,0/7,5	5,8/6,2	Ni 0,05/0,15	645	720
CuP 284	Remainder	4,8/5,2	14,5/15,5	—/—	645	800
CuP 285	Remainder	6,0/6,7	17,2/18,0	—/—	645	666
CuP 286	Remainder	6,6/7,5	17,0/19,0	—/—	645	645
Cu-Sn-Si-Sb alloys						
CuP 385	Remainder	6,0/7,0	—/—	Sn 6,0/7,0 Si 0,01/0,4	635	675
CuP 386	Remainder	6,4/7,2	—/—	Sn 6,5/7,5	650	700
CuP 389	Remainder	5,6/6,4	—/—	Sb 1,8/2,2	690	825

Maximum impurity limits applicable to all types are (% by mass) Al 0,01, Bi 0,030, Cd 0,010, Pb 0,025, Zn 0,05, Zn + Cd 0,05; total of all impurities = 0,25.

If Si is intentionally added to all alloys of Table 7, the range shall be between 0,05 and 0,25 (% by mass).

The filler metals then have to be designated additionally by description Si at the end. For example: Filler metal ISO 17672-CuP 279Si or Filler metal ISO 17672-B-Cu92PAg(Si)-645/825.

These filler metals should never be used on ferrous metals, nickel alloys or copper alloys containing nickel.

[a] Unlike the majority of filler metals in this International Standard, which only flow satisfactorily at, around or above the liquidus, most copper phosphorus filler metals are sufficiently fluid for brazing at a temperature significantly below the liquidus.

Table 8 — Class Cu: copper brazing filler metals — High Cu alloys

Code	Composition % by mass								Melting temperature (approximate)	
	Cu (including Ag)	Sn	Ag	Ni	P	Others	Cu_2O	**Total impurity limits** (see table footnote)	Solidus	Liquidus
	min.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	max.	°C	°C
Copper-cuprous oxide										
Cu 087	86,50	—/—	—/—	—/—	—/—	—/—	Remainder	0,50	1 083	1 083
Cu 099	99,00	—/—	—/—	—/—	—/—	—/—	Remainder	0,30 (excluding O)	1 083	1 083
Copper (99,9 min.)										
Cu 102	99,95	—/—	—/—	—/—	—/—	—/—	—/—	0,03 (excluding Ag)	1 083	1 083
Cu 110	99,90	—/—	—/—	—/—	—/—	—/—	—/—	0,04 (excluding O and Ag)	1 083	1 083
Cu 141	Remainder	—/—	—/—	—/—	—/0,075	—/—	—/—	0,060 (excluding Ag, As and Ni)	1 083	1 083
Cu-Ag alloy										
Cu 188	Remainder	—/—	0,8/1,2	—/—	—/—	Bi: —/0,1	—/—	0,3 (including Bi 0,1 max.)	1 070	1 080
Cu-Ni alloys										
Cu 186	Remainder	—/—	—/—	2,5/3,5	—/—	B: 0,02/0,05	—/—	0,15 (excluding Ag)	1 085	1 100
Cu-Sn alloys										
Cu 922	Remainder	5,5/7,0	—/—	—/—	0,01/0,40	—/—	—/—	Al 0,005	910	1 040
Cu 925	Remainder	11,0/13,0	—/—	—/—	0,01/0,40	—/—	—/—	Zn 0,05, others 0,1; total 0,4	825	990
Maximum impurity limits applicable to all types are (% by mass) Al 0,02 (except Cu 922), Cd 0,010 and Pb 0,025.										

Table 9 — Class Cu: copper brazing filler metals — Cu-Zn alloys

Code	Composition % by mass							Melting temperature (approximate)	
	Cu min./max.	Zn	Sn min./max.	Si min./max.	Mn min./max.	Ni min./max.	Fe min./max.	Solidus °C	Liquidus °C
Cu 470	57,0/61,0	Remainder	0,2/0,5	—/—	—/—	—/—	—/—	875	895
Cu 470[a]	58,5/61,5	Remainder	—/—	0,2/0,4	—/—	—/—	—/—	875	895
Cu 471	56,0/60,0	Remainder	0,2/0,5	0,15/0,2	0,05/0,25	—/—	—/—	870	900
Cu 670	58,5/61,5	Remainder	—/0,2	0,15/0,4	0,05/0,25	—/—	—/—	870	900
Cu 671	56,0/62,0	Remainder	0,5/1,5	0,1/0,5	0,2/1,0	0,2/1,5	—/—	870	890
Cu 680	56,0/60,0	Remainder	0,8/1,1	0,04/0,20	0,01/0,50	0,20/0,80	0,2/1,2	866	882
Cu 681	56,0/60,0	Remainder	0,8/1,1	0,04/0,15	0,01/0,50	—/—	0,2/1,2	866	888
Cu 773	46,0/50,0	Remainder	—/—	0,15/0,2	—/—	9,0/11,0	—/—	890	920
Maximum impurity limits applicable to all types are (% by mass) Al 0,01, As 0,01, Bi 0,01, Cd 0,010, Fe 0,25, Pb 0,025, Sb 0,01; total impurities (excluding Fe) 0,2.									

Table 10 — Class Cu: copper brazing filler metals — Cu special alloys

Code	Composition % by mass										Melting temperature (approximate)	
	Cu	Al	Fe	Mn	Ni	P	Si	Sn	Zn	Total impurities	Solidus	Liquidus
		min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	max.	°C	°C
Cu-Si-Mn alloys												
Cu 511	Remainder	—/0,01	—/0,03	0,1/0,4	—/0,1	—/0,020	0,1/0,4	0,5/1,0	—	0,1	1 020	1 050
Cu 521	Remainder	—/0,01	—/0,1	0,5/1,5	—/—	—/0,02	1,5/2,0	0,1/0,3	—/0,2	0,5	1 030	1 050
Cu 541	Remainder	—/0,05	—/0,2	0,7/1,3	—/—	—/0,05	2,7/3,2	—	—/0,4	0,5	980	1 035
Cu-Al alloys												
Cu 551	Remainder	4,5/5,5	—/0,5	0,1/1,0	1,0/2,5	—/—	—/0,1	—	—/0,2	0,5	1 040	1 075
Cu 561	Remainder	7,0/9,0	—/0,5	—/0,5	—/0,5	—/—	—/0,2	—/0,1	—/0,2	0,2	1 030	1 040
Cu 565	Remainder	8,5/11,5	0,5/1,5	—/—	—/—	—/—	—/0,1	—	—/0,02	0,5	1 030	1 040
Cu-Mn-Ni alloys												
Cu 571	Remainder	7,0/8,5	2,0/4,0	11,0/14,0	1,5/3,0	—/—	—/0,1	—	—/0,15	0,5	945	985
Cu 595	Remainder	—/0,01	—/—	11,0/14,0	1,5/5,0	—/—	0,10/0,25	—/—	—/—	0,5	965	1 000
Maximum impurity limits applicable to all types are (% by mass) Cd 0,010 and Pb 0,025.												

Table 11 — Classes Ni: nickel (and cobalt brazing) filler metals

Code	Composition % by mass													Melting temperature (approximate)	
	Ni	Co	Cr	Si	B	Fe	C	P	W	Cu	Mn	Mo	Nb	Solidus	Liquidus
	min./ max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	°C	°C
Ni-Cr-B alloys															
Ni 600	Rem.	—/0,10	13,0/15,0	4,0/5,0	2,75/3,50	4,0/5,0	0,60/0,90	—/0,02	—/—	—/—	—/—	—/—	—/—	980	1 060
Ni 610	Rem.	—/0,10	13,0/15,0	4,0/5,0	2,75/3,50	4,0/5,0	—/0,06	—/0,02	—/—	—/—	—/—	—/—	—/—	980	1 070
Ni 612	Rem.	—/0,10	13,5/16,5	—/—	3,25/4,0	—/1,5	—/0,06	—/0,02	—/—	—/—	—/—	—/—	—/—	1 055	1 055
Ni 620	Rem.	—/0,10	6,0/8,0	4,0/5,0	2,75/3,50	2,5/3,5	—/0,06	—/0,02	—/—	—/—	—/—	—/—	—/—	970	1 000
Ni-Si-B alloys															
Ni 630	Rem.	—/0,10	—/—	4,0/5,0	2,75/3,50	—/0,5	—/0,06	—/0,02	—/—	—/—	—/—	—/—	—/—	980	1 040
Ni 631	Rem.	—/0,10	—/—	3,0/4,0	1,50/2,20	—/1,5	—/0,06	—/0,02	—/—	—/—	—/—	—/—	—/—	980	1 070
Ni-Cr-Si alloys															
Ni 650	Rem.	—/0,10	18,5/19,5	9,75/10,50	—/0,03	—/—	—/0,06	—/0,02	—/—	—/—	—/—	—/—	—/—	1 080	1 135
Ni 655	Rem.	—/0,10	21,0/23,0	6,0/7,0	—/0,01	—/—	—/0,16	3,5/4,5	—/—	—/—	—/—	—/—	—/—	960	1 079
Ni 660	Rem.	—/0,10	18,5/19,5	7,0/7,5	1,0/1,5	—/0,5	—/0,10	—/0,02	—/—	—/—	—/—	—/—	—/—	1 065	1 150
Ni 661	Rem.	—/1,0	14,5/15,5	7,0/7,5	1,1/1,6	—/1,0	—/0,06	—/0,02	—/—	—/—	—/—	—/—	—/—	1 030	1 125
Ni-W-Cr alloys															
Ni 670	Rem.	—/0,10	10,0/13,0	3,0/4,0	2,0/3,0	2,5/4,5	0,40/0,55	—/0,02	15,0/17,0	—/—	—/—	—/—	—/—	970	1 105
Ni 671	Rem.	—/0,10	9,0/11,75	3,35/4,25	2,2/3,1	2,5/4,0	0,30/0,50	—/0,02	11,5/12,75	—/—	—/—	—/—	—/—	970	1 095
Ni-P alloys															
Ni 700	Rem.	—/0,10	—/—	—/—	—/—	—/—	—/0,06	10,0/12,0	—/—	—/—	—/—	—/—	—/—	875	875
Ni 710	Rem.	—/0,10	13,0/15,0	—/0,10	—/0,02	—/0,2	—/0,06	9,7/10,5	—/—	—/—	—/0,04	—/—	—/—	890	890
Ni 720	Rem.	—/0,10	24,0/26,0	—/0,10	—/0,02	—/0,2	—/0,06	9,0/11,0	—/—	—/—	—/—	—/—	—/—	880	950
Ni-Mn-Si-Cu alloys															
Ni 800	Rem.	—/0,10	—/—	6,0/8,0	—/—	—/—	—/0,06	—/0,02	—/—	4,0/5,0	21,5/24,5	—/—	—/—	980	1 010
Ni-Cr-B-Si-Cu-Mo-Nb alloys															

Maximum impurity limits applicable to all types are (% by mass) Al 0,05, Cd 0,010, Pb 0,025, S 0,02, Se 0,005, Ti 0,05, Zr 0,05; if elements other than those given here are found to be present, the amount of these elements shall be determined; the total of such other elements shall not exceed 0,50 %.

Table 11 *(continued)*

Code	Composition % by mass													Melting temperature (approximate)	
	Ni	Co	Cr	Si	B	Fe	C	P	W	Cu	Mn	Mo	Nb	Solidus	Liquidus
	min./ max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	min./max.	°C	°C
Ni 810	Rem.	—/0,10	7,0/9,0	3,8/4,8	2,75/3,50	—/0,4	—/0,06	—/0,02	—/—	2,0/3,0	—/—	1,5/2,5	1,5/2,5	970	1 080
Co-Ni-Si-W alloys															
Co 900	16,0/18,0	Rem.	18,0/20,0	7,5/8,5	0,70/0,90	—/1,0	0,35/0,45	—/0,02	3,5/4,5	—/—	—/—	—/—	—/—	1 120	1 150
Maximum impurity limits applicable to all types are (% by mass) Al 0,05, Cd 0,010, Pb 0,025, S 0,02, Se 0,005, Ti 0,05, Zr 0,05; if elements other than those given here are found to be present, the amount of these elements shall be determined; the total of such other elements shall not exceed 0,50 %.															

Table 12 — Class Pd: palladium bearing brazing filler metals

Code	Composition % by mass						Melting temperature (approximate)	
	Ag min./max.	Cu min./max.	Pd min./max.	Mn min./max.	Ni min./max.	Co min./max.	Solidus °C	Liquidus °C
Pd 287[a]	67,0/69,0	26,0/27,0	4,5/5,5	—/—	—/—	—/—	805	810
Pd 288[a]	94,5/95,5	—/—	4,5/5,5	—/—	—/—	—/—	970	1 010
Pd 387[a]	57,0/59,0	31,0/33,0	9,5/10,5	—/—	—/—	—/—	825	850
Pd 388[a]	67,0/68,0	22,0/23,0	9,5/10,5	—/—	—/—	—/—	830	860
Pd 481[a]	64,5/65,5	19,5/20,5	14,5/15,5	—/—	—/—	—/—	850	900
Pd 483[a]	—/—	81,5/82,5	17,5/18,5	—/—	—/—	—/—	1 080	1 090
Pd 484[a]	51,5/52,5	27,5/28,5	19,5/20,5	—/—	—/—	—/—	875	900
Pd 485[a]	74,5/75,5	—/—	19,5/20,5	4,5/5,5	—/—	—/—	1 000	1 120
Pd 496[a]	—/—	—/—	20,5/21,5	30,5/31,5	47,0/49,0	—/—	1 120	1 120
Pd 587[a]	53,0/55,0	20,5/21,5	24,5/25,5	—/—	—/—	—/—	900	950
Pd 597[a]	63,0/65,0	—/—	32,0/—33,5	2,5/3,5	—/—	—/—	1 180	1 200
Pd 647[a]	—/—	—/—	59,5/60,5	—/—	39,5/40,5	—/—	1 235	1 235
Pd 657[a]	—/—	—/—	64,0/66,0	—/—	—/0,06	34,0/36,0	1 235	1 252

For Pd 287, Pd 288, Pd 387, Pd 388, Pd 481, Pd 483, Pd 484, Pd 587 and Pd 657, maximum impurity limits applicable are (% by mass) Al 0,0010, P 0,008, Ti 0,002, Zr 0,002; total of all impurities = 0,15.

For Pd 485 and Pd 597, maximum impurity limits are (% by mass) Al 0,010, Ti 0,01, Zr 0,01; total of all impurities = 0,30.

[a] For special vacuum applications, see Table 1.

Table 13 — Class Au: gold bearing brazing filler metals

Code	Composition % by mass						Melting temperature (approximate)	
	Au min./max.	Cu min./max.	Ni min./max.	Pd min./max.	Ag min./max.	Others min./max.	Solidus °C	Liquidus °C
Au 295[a]	29,5/30,5	69,5/70,5	—/—	—/—	—/—	—/—	995	1 020
Au 300	29,5/30,5	—/—	35,5/36,5	33,5/34,5	—/—	—/—	1 135	1 165
Au 351	34,5/35,5	61,0/63,0	2,5/3,5	—/—	—/—	—/—	975	1 030
Au 354	34,5/35,5	64,5/65,5	—/—	—/—	—/—	—/—	990	1 010
Au 375[a]	37,0/38,0	62,0/63,0	—/—	—/—	—/—	—/—	980	1 000
Au 503	49,5/50,5	49,5/50,5	—/—	—/—	—/—	—/—	955	970
Au 507	49,5/50,5	—/—	24,5/25,5	24,0/26,0	—/—	Co —/0,06	1 100	1 120
Au 625[a]	62,0/63,0	37,0/38,0	—/—	—/—	—/—	—/—	930	940
Au 700	69,5/70,5	—/—	21,5/22,5	7,5/8,5	—/—	—/—	1 005	1 045
Au 752[a]	74,5/75,5	—/—	24,5/25,5	—/—	—/—	—/—	950	990
Au 755	74,5/75,5	11,5/13,5	—/—	—/—	12,0/13,0	—/—	880	895
Au 800	79,5/80,5	19,5/20,5	—/—	—/—	—/—	—/—	890	890
Au 801[a]	79,5/80,5	18,5/19,5	—/—	—/—	—/—	Fe 0,5/1,5	905	910
Au 827[a]	81,5/82,5	—/—	17,5/18,5	—/—	—/—	—/—	950	950
Au 927	91,0/93,0	—/—	—/—	7,0/9,0	—/—	—/—	1 200	1 240

Maximum impurity limits applicable to all types are (% by mass) Al 0,0010, Cd 0,010, P 0,008, Pb 0,025, Ti 0,002, Zr 0,002; total of all impurities = 0,15.

[a] For special vacuum applications, see Table 1.

Annex A
(normative)

Codification

Two systems for the codification of filler metals are used in this International Standard. For the purposes of identifying a filler metal complying with this International Standard, e.g. in other International Standards, in orders, in brazing procedures or on drawings, any of these systems can be used.

The first system divides the filler metals into seven classes. The class to which a filler metal is assigned is based, in most cases, on the major element present, but in some instances, it has been decided by the similarity of the filler metal to others in the same class.

The seven classes are as follows:

a) Al: filler metals containing aluminium as the major element;

b) Ag: filler metals containing silver as a significant addition, even if not the major element;

c) CuP: filler metals containing copper as the major element with an addition of phosphorus;

d) Cu: filler metals containing copper as the major element, not elsewhere classified;

e) Ni: filler metals containing nickel as the major element; one is based on cobalt;

f) Pd: filler metals containing palladium, in any amount;

g) Au: filler metals containing gold, in any amount.

The code for each filler metal consists of the two letters for the class, followed by three digits.

The second system is that given in ISO 3677. However, this system can assign the same code to filler metals which differ only slightly in chemical composition but significantly in behaviour.

The relationship between these two systems and the former systems is given in Table A.1.

Table A.1 — Codification systems

ISO	ISO 3677	AWS	EN 1044	JIS
Aluminium brazing filler metals				
Al 105	B-Al95Si-575/630		AL 101	
Al 107	B-Al92Si-575/615	BAlSi-2	AL 102	BA4343
Al 110	B-Al90Si-575/590	BAlSi-5	AL 103	BA4045
Al 112	B-Al88Si-575/585	BAlSi-4	AL 104	BA4047
Al 210	B-Al86SiCu-520/585	BAlSi-3	AL 201	BA4145
Al 310	B-Al89SiMg-555/590	BAlSi-7	AL 301	BA4004
Al 311	B-Al89SiMg(Bi)-555/590	BAlSi-11	AL 302	BA4104
Al 315	B-Al90Si-559/591			BA4005
Al 317	B-Al88SiMg-562/582	BAlSi-9		
Al 319	B-Al89SiMg-559/579			BA4N04
Al 410	B-Al87SiZn-576/588			BA4N45
Al 415	B-Al90SiZn-576/609			BA4N43
Mg 001	B-Mg88AlZnMn-443/599	BMg-1		

Table A.1 *(continued)*

ISO	ISO 3677	AWS	EN 1044	JIS
Silver brazing filler metals				
Ag 125	B-Cu40ZnAgSn-680/760	BAg-37	AG 108	
Ag 130	B-Cu36ZnAgSn-665/755		AG 107	
Ag 134	B-Cu36AgZnSn-630/730		AG 106	BAg-7B
Ag 138	B-Ag38CuZnSn-650/720	BAg-34		BAg-34
Ag 140	B-Ag40CuZnSn-650/710	BAg-28	AG 105	BAg-28
Ag 145	B-Ag45CuZnSn-640/680	BAg-36	AG 104	BAg-7A
Ag 155	B-Ag55ZnCuSn-630/660		AG 103	
Ag 156	B-Ag56CuZnSn-620/655	BAg-7	AG 102	BAg-7
Ag 160	B-Ag60CuSn-600/730	BAg-18	AG 402	BAg-18
Ag 205	B-Cu55ZnAg(Si)-820/870		AG 208	
Ag 212	B-Cu48ZnAg(Si)-800/830		AG 207	
Ag 220	B-Cu43ZnAg(Si)-690/810		AG 206	
Ag 225	B-Cu40ZnAg-700/790		AG 205	BAg-20A
Ag 230	B-Cu38ZnAg-680/765	BAg-20	AG 204	BAg-20
Ag 230[a]	B-CuZnAgNi-676/788			
Ag 235	B-Ag35ZnCu-685/755	BAg-35		BAg-35
Ag 244	B-Ag44CuZn-675/735		AG 203	
Ag 245	BAg-45CuZn-665/745	BAg-5		BAg-5
Ag 250	B-Ag50CuZn-690/775	BAg-6		BAg-6
Ag 265	B-Ag65CuZn-670/720	BAg-9		BAg-9
Ag 270	B-Ag70CuZn-690/740	BAg-10		BAg-10
Ag 272	B-Ag72Cu-780	BAg-8	AG 401	BAg-8
Ag 326	B-Cu30ZnAgCd-605/720	BAg-33	AG 307	
Ag 330	B-Ag30CuCdZn-600/690		AG 306	
Ag 335	B-Ag35CuZnCd-610/700	BAg-2	AG 305	BAg-2
Ag 340	B-Ag40ZnCdCu-595/630		AG 304	
Ag 345	B-Ag45CdZnCu-605/620	BAg-1	AG 302	BAg-1
Ag 350	B-Ag50CdZnCu-620/640	BAg-1a	AG 301	BAg-1A
Ag 351	B-Ag50CdZnCuNi-635/655	BAg-3	AG 351	
Ag 425	B-Cu38ZnAgNiMn-705/800	BAg-26		BAg-26
Ag 427	B-Cu38AgZnMnNi-680/830		AG 503	
Ag 440	B-Ag40CuZnNi-670/780	BAg-4		BAg-4
Ag 449	B-Ag49ZnCuMnNi-680/705	BAg-22	AG 502	BAg-22
Ag 450	B-Ag50ZnCuNi-660/705	BAg-24		BAg-24
Ag 454	B-Ag54CuZnNi-720/855	BAg-13		BAg-13
Ag 456	B-Ag56CuNi-770/895	BAg-13a		BAg-13A
Ag 456[a]	B-Ag56CuInNi-600/710		AG 403	
Ag 463	B-Ag63CuSnNi-690/800	BAg-21		BAg-21
Ag 485	B-Ag85Mn-960/970	BAg-23	AG 501	BAg-23
Copper-phosphorus brazing filler metals				
CuP 178	B-Cu95P-710/925			BCuP-1
CuP 179	B-Cu94P-710/890		CP 203	
CuP 180	B-Cu93P-710/820		CP 202	BCuP-2

Table A.1 *(continued)*

ISO	ISO 3677	AWS	EN 1044	JIS
CuP 181	B-Cu93P-710/793	BCuP-2		
CuP 182	B-Cu92P-710/770		CP 201	
CuP 279	B-Cu92PAg-645/825		CP 105	
CuP 280	B-Cu91PAg-643/788	BCuP-6		BCuP-6
CuP 281	B-Cu89PAg-645/815	BCuP-3		
CuP 281[a]	B-Cu89PAg-645/815		CP 104	
CuP 282	B-Cu88PAg-643/771	BCuP-7		BCuP-7
CuP 283	B-Cu87PAg-643/720	BCuP-4		BCuP-4
CuP 283[a]	B-Cu87PAg(Ni)-643/720		CP 103	
CuP 284	B-Cu80AgP-645/800	BCuP-5	CP 102	BCuP-5
CuP 285	B-Cu76AgP-643/666	BCuP-8		
CuP 286	B-Cu75AgP-645		CP 101	BCuP-8
CuP 385	B-Cu87PSn(Si)-635/675	BCuP-9		BCuP-9
CuP 386	B-Cu86SnP-650/700		CP 302	
CuP 389	B-Cu92PSb-690/825		CP 301	
Copper brazing filler metals				
Cu 087	B-Cu87-1083	BCu-2		BCu-2
Cu 099	B-Cu99-1083	BCu-1a	CU 103	BCu-1A
Cu 102	B-Cu100-1083	BCu-3	CU 102	
Cu 110	B-Cu100-1083	BCu-1b	CU 101	BCu-1
Cu 141	B-Cu100(P)-1083	BCu-1	CU 104	
Cu 186	B-Cu97Ni(B)-1083/1100		CU 105	
Cu 188	B-Cu99Ag-1070/1080		CU 106	
Cu 922	B-Cu94Sn(P)-910/1040		CU 201	
Cu 925	B-Cu88Sn(P)-825/990		CU 202	
Cu 470	B-Cu60Zn(Sn)-875/895	RBCuZn-A	CU 302	BCu-6
Cu 470[a]	B-Cu60Zn(Si)-875/895		CU 301	BCu-5
Cu 471	B-Cu58Zn(Sn)(Si)(Mn)-870/900		CU 304	
Cu 670	B-Cu60Zn(Si)(Mn)-870/900		CU 303	
Cu 671	B-Cu59ZnSn(Ni)(Mn)(Si)-870/890		CU 306	
Cu 680	B-Cu58ZnSn(Fe)(Ni)(Mn)-866/882	RBCuZn-B		
Cu 681	B-Cu58ZnSn(Fe)(Mn)(Si)-866/888	RBCuZn-C		
Cu 773	B-Cu48ZnNi(Si)-890/920	RBCuZn-D	CU 305	BCu-8
Cu 511	B-Cu99(Sn)(Mn)(Si)-1020/1050			
Cu 521	B-Cu97SiMn(Sn)-1030/1050			
Cu 541	B-Cu96SiMn-980/1035			
Cu 551	B-Cu92AlNi(Mn)-1040/1075			
Cu 561	B-Cu92Al-1030/1040			
Cu 565	B-Cu89AlFe-1030/1040			
Cu 571	B-Cu74MnAlFeNi-945/985			
Cu 595	B-Cu84MnNi-965/1000			

Table A.1 *(continued)*

ISO	ISO 3677	AWS	EN 1044	JIS
Nickel and cobalt brazing filler materials				
Ni 600	B-Ni73CrFeSiB(C)-980/1060	BNi-1	NI 101	BNi-1
Ni 610	B-Ni74CrFeSiB-980/1070	BNi-1a	NI 1A1	BNi-1A
Ni 612	B-Ni81CrB-1055	BNi-9	NI 109	BNi-9
Ni 620	B-Ni82CrSiBFe-970/1000	BNi-2	NI 102	BNi-2
Ni 630	B-Ni92SiB-980/1040	BNi-3	NI 103	BNi-3
Ni 631	B-Ni95SiB-980/1070	BNi-4	NI 104	BNi-4
Ni 650	B-Ni71CrSi-1080/1135	BNi-5	NI 105	BNi-5
Ni 655	B-Ni68CrSiP-960/1079			
Ni 660	B-Ni73CrSiB-1065/1150	BNi-5a		BNi-5A
Ni 661	B-Ni77CrSiBFe-1030/1125	BNi-5b		BNi-5B
Ni 670	B-Ni63WCrFeSiB-970/1105	BNi-10	NI 110	BNi-10
Ni 671	B-Ni67WCrSiFeB-970/1095	BNi-11	NI 111	BNi-11
Ni 700	B-Ni89P-875	BNi-6	NI 106	BNi-6
Ni 710	B-Ni76CrP-890	BNi-7	NI 107	BNi-7
Ni 720	B-Ni65CrP-880/950	BNi-12	NI 112	BNi-12
Ni 800	B-Ni66MnSiCu-980/1010	BNi-8	NI 108	BNi-8
Ni 810	B-Ni78CrSiBCuMo-970/1080	BNi-13		BNi-13
Co 900	B-Co51CrNiSiW(B)-1120/1150	BCo-1	CO 101	BCo-1
Palladium bearing brazing filler metals				
Pd 287	B-Ag68CuPd-805/810	BVAg-30	PD 106	BPd-1
Pd 288	B-Ag95Pd-970/1010		PD 204	BPd-7
Pd 387	B-Ag58CuPd-825/850	BVAg-31	PD 105	BPd-2
Pd 388	B-Ag68CuPd-830/860		PD 104	BPd-3
Pd 481	B-Ag65CuPd-850/900		PD 103	BPd-4
Pd 483	B-Cu82Pd-1080/1090		PD 203	BPd-8
Pd 484	B-Ag52CuPd-875/900		PD 102	BPd-5
Pd 485	B-Ag75PdMn-1000/1120		PD 202	BPd-9
Pd 496	B-Ni48MnPd-1120			BPd-11
Pd 587	B-Ag54PdCu-900/950	BVAg-32	PD 101	BPd-6
Pd 597	B-Ag64PdMn-1180/1200			BPd-10
Pd 647	B-Pd60Ni-1235		PD 201	BPd-14
Pd 657	BPd65Co-1235/1252	BPVPd-1	PD 301	
Gold bearing brazing filler metals				
Au 295	B-Cu70Au-995/1020		AU 104	BAu-1A
Au 300	B-Ni36PdAu-1135/1165	BAu-5		BAu-5
Au 351	B-Cu62AuNi-975-1030	BAu-3		BAu-3
Au 354	B-Cu65Au-990/1010	BVAu-9		
Au 375	B-Cu62Au-980/1000	BAu-1	AU 103	BAu-1
Au 503	B-Au50Cu-955/970	BVAu-10		BAu-11
Au 507	B-Au50NiPd-1100/1120	BVAu-7		
Au 625	B-Au62Cu-930/940		AU 102	
Au 700	B-Au70NiPd-1005/1045	BAu-6		BAu-6
Au 752	B-Au75Ni-950/990		AU 106	

Table A.1 *(continued)*

ISO	ISO 3677	AWS	EN 1044	JIS
Au 755	B-Au75AgCu-880/895			BAu-12
Au 800	B-Au80Cu-890	BAu-2		BAu-2
Au 801	B-Au80Cu(Fe)-905/910		AU 101	
Au 827	B-Au82Ni-950	BAu-4	AU 105	
Au 927	B-Au92Pd-1200/1240	BVAu-8		

Bibliography

[1] ISO 14344, *Welding consumables — Procurement of filler materials and fluxes*

[2] EN 1044, *Brazing — Filler metals*

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