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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 document 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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 13, *Brazing materials and processes*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 121, *Welding and allied processes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 17672:2016), which has been technically revised.

The main changes are as follows:

- in ~~6~~ Clause 6, the spatter test was added;
- in ~~8.2.28.2.2~~, a note on foils with a width of less than 3 mm was added;
- in ~~Table 6~~ Table 6, four new silver brazing filler metals were added;
- in ~~Table 7~~ Table 7, the range of Si was changed to 0,01 up to 0,25 (mass fraction %) if intentionally added;
- in ~~Table 11~~ Table 11, two new Ni-Cr-P-Si alloys were added;

— ~~in Table A.1~~ in Table A.1, the codes were updated and corresponding GB codes were added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html). Official interpretations of ISO/TC 44 documents, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

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# Brazing — Filler metals

## 1 Scope

This document 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-Annex A](#).

In the case of composite products, such as flux-coated rods, pastes or plastics tapes, this document 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, such as precious metal jewellery, aerospace and dental, filler metals other than those included in this document are often used. These are covered by other International Standards to which reference can be made.

## 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.

ISO 80000-1:2009/2022, *Quantities and units — Part 1: General*

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

## 4 Composition

The filler metal shall have a composition in accordance with [Tables 5](#) to [Table 1](#) 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 document 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) ~~1)~~ greater than five; or
- 2) ~~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) ~~e)~~ 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 conformity to the requirements of this document, the actual test values obtained shall be subjected to the rounding-off instructions given in ISO 80000-1:20092022, 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.

## 5 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~~ Table 1.

Filler metals conforming to ~~Table 1~~ 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 duties.

**Table 1 — Impurity limits for special vacuum requirements**

Impurity	Limit max. mass fraction %	
	Grade 1	Grade 2
Ca <sup>a</sup>	0,005	0,005
Cd	0,001	0,002
P	0,002	0,002 <sup>b</sup>
Pb	0,002	0,002
Zn	0,001	0,002
Mn <sup>c</sup>	0,001	0,002
In <sup>c</sup>	0,002	0,003
All other elements where vapour pressure at 500 °C is > 1,3 × 10 <sup>-5</sup> Pa <sup>d</sup>	0,001	0,002

<sup>a</sup>— For filler metal Ag 272 (see ~~Table 6~~ Table 6), lower levels can be available by agreement between the purchaser and the supplier.

<sup>b</sup>— For filler metal Ag 272, 0,02 % maximum.

<sup>c</sup>— Except where otherwise specified in ~~Tables 5~~ Tables 5 to 13.

<sup>d</sup>— 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 %.



## 6 Chemical analysis

Chemical analyses shall be carried out by any suitable method but, in the case of many brazing alloys, the use of reference materials can 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.

To determine the oxide content of brazing filler metals for vacuum applications, a spatter test may be performed, see Reference ~~[3]~~[3].

## 7 Designation

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

As an example, the designations of an aluminium filler metal containing 11 % to 13 % Si, in accordance with this document, 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 document;  
“Al 112” is the short code given in Tables 5 Tables 5 to 13-13.

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

where

“Filler metal” is the description; [ISO/PRF 17672](https://standards.iteh.ai/catalog/standards/iso/4db77450-ab80-4503-af90-bdc3a050556f/iso-prf-17672)  
“ISO 17672” is the reference to this document;  
“B” denotes brazing;  
“Al88Si-575/585” is the code in accordance with ISO 3677.

## 8 Technical delivery conditions

### 8.1 Types of product

The form of the material shall be agreed between the purchaser and the manufacturer or 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 and wire can be completely or partially coated or cored with flux.

## 8.2 Dimensions

### 8.2.1 General

Dimensions and tolerances for foils (see 8.2.2), rods (see 8.2.3) and, to a lesser extent, wires (see 8.2.4) are defined. For other forms and dimensions not listed in the respective tables, the purchaser and the manufacturer or supplier shall agree on the dimensions and tolerances at the time of placing the order.

### 8.2.2 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	$\frac{+0,2}{0} \frac{+0,2}{0}$	$\frac{+0,3}{0} \frac{+0,3}{0}$	$\frac{+0,4}{0} \frac{+0,4}{0}$
0,1	1,0	$\frac{+0,2}{0} \frac{+0,2}{0}$	$\frac{+0,3}{0} \frac{+0,3}{0}$	$\frac{+0,4}{0} \frac{+0,4}{0}$
1,0	2,0	$\frac{+0,3}{0} \frac{+0,3}{0}$	$\frac{+0,4}{0} \frac{+0,4}{0}$	$\frac{+0,5}{0} \frac{+0,5}{0}$

**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

NOTE Foils with a width of less than 3 mm cannot be measured due to their very easy deformability, as they straighten out even under the slightest force. Therefore, the reproducibility of the values based on the existing measuring methods – and possibilities – is not given.

### 8.2.3 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  $\pm 3\%$  for drawn rods and  $\pm 0,3$  mm for other fabrication processes. The tolerance on length shall be  $\pm 5$  mm.

### 8.2.4 Wires

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

## 8.3 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.

## 8.4 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) ~~a)~~ the designation in accordance with ~~Clause 6;~~ Clause 6;
- b) ~~b)~~ the name of the manufacturer or supplier;
- c) ~~c)~~ the trade name (if any);
- d) ~~d)~~ the quantity of material and, if applicable, the dimensions;
- e) ~~e)~~ the supplier's batch number;
- f) ~~f)~~ any hazard warnings as applicable.

## 8.5 Packaging

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