

# Alloys

| Material Designation |           | Composition in % (m/m) |                    |      |        |                    |       |       |                           |          |
|----------------------|-----------|------------------------|--------------------|------|--------|--------------------|-------|-------|---------------------------|----------|
| Symbolic             | Numerical | Element                | Cu                 | Ag   | Bi     | O                  | P     | Pb    | Other elements (see note) |          |
|                      |           |                        |                    |      |        |                    |       |       | Total                     | excluded |
| Cu-ETP               | CW004A    | min.                   | 99.90 <sup>a</sup> | –    | –      | –                  | –     | –     | –                         | Ag, O    |
|                      |           | max.                   | –                  | –    | 0,0005 | 0.040 <sup>b</sup> | –     | 0,005 | 0,03                      |          |
| Cu-FRHC              | CW005A    | min.                   | 99.90 <sup>a</sup> | –    | –      | –                  | –     | –     | –                         | Ag, O    |
|                      |           | max.                   | –                  | –    | –      | 0.040 <sup>b</sup> | –     | –     | 0,06                      |          |
| Cu-OF                | CW008A    | min.                   | 99.95 <sup>a</sup> | –    | –      | –                  | –     | –     | –                         | Ag       |
|                      |           | max.                   | –                  | –    | 0,0005 | – <sup>c</sup>     | –     | 0,005 | 0,03                      |          |
| CuAg0,04             | CW011A    | min.                   | Rest               | 0,03 | –      | –                  | –     | –     | –                         | Ag, O    |
|                      |           | max.                   | –                  | 0,05 | 0,0005 | 0,040              | –     | –     | 0,03                      |          |
| CuAg0,07             | CW012A    | min.                   | Rest               | 0,06 | –      | –                  | –     | –     | –                         | Ag, O    |
|                      |           | max.                   | –                  | 0,08 | 0,0005 | 0,040              | –     | –     | 0,03                      |          |
| CuAg0,10             | CW013A    | min.                   | Rest               | 0,08 | –      | –                  | –     | –     | –                         | Ag, O    |
|                      |           | max.                   | –                  | 0,12 | 0,0005 | 0,040              | –     | –     | 0,03                      |          |
| CuAg0,04P            | CW014A    | min.                   | Rest               | 0,03 | –      | –                  | 0,001 | –     | –                         | Ag, P    |
|                      |           | max.                   | –                  | 0,05 | 0,0005 | – <sup>c</sup>     | 0,007 | –     | 0,03                      |          |

| Material Designation   |           | Composition in % (m/m) |                    |      |        |                |       |       |                           |          |
|--|-----------|------------------------|--------------------|------|--------|----------------|-------|-------|---------------------------|----------|
| Symbolic   | Numerical | Element                | Cu                 | Ag   | Bi     | O              | P     | Pb    | Other elements (see note) |          |
|  |           |                        |                    |      |        |                |       |       | Total                     | excluded |
| CuAg0,07P  | CW015A    | min.                   | Rest               | 0,06 | –      | –              | 0,001 | –     | –                         | Ag, P    |
|  |           | max.                   | –                  | 0,08 | 0,0005 | – <sup>c</sup> | 0,007 | –     | 0,03                      |          |
| CuAg0,10P  | CW016A    | min.                   | Rest               | 0,08 | –      | –              | 0,001 | –     | –                         | Ag, P    |
|  |           | max.                   | –                  | 0,12 | 0,0005 | – <sup>c</sup> | 0,007 | –     | 0,03                      |          |
| CuAg0,04(OF)   | CW017A    | min.                   | Rest               | 0,03 | –      | –              | –     | –     | –                         | Ag, O    |
|  |           | max.                   | –                  | 0,05 | 0,0005 | – <sup>c</sup> | –     | –     | 0,0065                    |          |
| CuAg0,07(OF)   | CW018A    | min.                   | Rest               | 0,06 | –      | –              | –     | –     | –                         | Ag, O    |
|  |           | max.                   | –                  | 0,08 | 0,0005 | – <sup>c</sup> | –     | –     | 0,0065                    |          |
| CuAg0,10(OF)   | CW019A    | min.                   | Rest               | 0,08 | –      | –              | –     | –     | –                         | Ag, O    |
|  |           | max.                   | –                  | 0,12 | 0,0005 | – <sup>c</sup> | –     | –     | 0,0065                    |          |
| Cu-PHC   | CW020A    | min.                   | 99.95 <sup>a</sup> | –    | –      | –              | 0,001 | –     | –                         | Ag, P    |
|  |           | max.                   | –                  | –    | 0,0005 | – <sup>c</sup> | 0,006 | 0,005 | 0,03                      |          |
| Cu-HCP   | CW021A    | min.                   | 99.95 <sup>a</sup> | –    | –      | –              | 0,002 | –     | –                         | Ag, P    |
|  |           | max.                   | –                  | –    | 0,0005 | – <sup>c</sup> | 0,007 | 0,005 | 0,03                      |          |
| NOTE – The total of other elements ( different from copper) is defined as the sum of Ag, As, Bi, Cd, Co, Cr, Fe, Mn, Ni, O, P , Pb, S, Sb, Se, Si, Sn, Te and Zn, with the exclusion of any of the elements whose value is indicated individually. |           |                        |                    |      |        |                |       |       |                           |          |
| <sup>a</sup> Including silver (Ag), up to a maximum of 0.015%  |           |                        |                    |      |        |                |       |       |                           |          |
| <sup>b</sup> Up to 0.060% of oxygen content is permitted, subject to an agreement between client and supplier.   |           |                        |                    |      |        |                |       |       |                           |          |

| Material Designation   |           | Composition in % (m/m) |    |    |    |   |   |    |                           |          |
|--|-----------|------------------------|----|----|----|---|---|----|---------------------------|----------|
| Symbolic   | Numerical | Element                | Cu | Ag | Bi | O | P | Pb | Other elements (see note) |          |
|  |           |                        |    |    |    |   |   |    | Total                     | excluded |
| ° Oxygen content must be such that the material complies with the requisites for embrittlement by heating in a hydrogen atmosphere as in Norm En 1976. |           |                        |    |    |    |   |   |    |                           |          |

**ALEACIONES. COMPOSICIÓN DEL Cu-OFE y Cu-PHCE según EN 13601**

| Material Designation |           | Element | Composition in % (mass fraction) |            |            |             |            |             |            |            |                |            |            |            |            |             |            |             |            |
|----------------------|-----------|---------|----------------------------------|------------|------------|-------------|------------|-------------|------------|------------|----------------|------------|------------|------------|------------|-------------|------------|-------------|------------|
| Symbolic             | Numerical |         | Cu                               | Ag         | As         | Bi          | Cd         | Fe          | Mn         | Ni         | O              | P          | Pb         | S          | Sb         | Se          | Sn         | Te          | Zn         |
| <b>Cu-OFE</b>        | CW009A    | min.    | 99,99                            | –          | –          | –           | –          | –           | –          | –          | –              | –          | –          | –          | –          | –           | –          | –           | –          |
|                      |           | max.    | –                                | 0,002<br>5 | 0,000<br>5 | 0,000<br>20 | 0,000<br>1 | 0,0001<br>0 | 0,000<br>5 | 0,000<br>1 | – <sup>a</sup> | 0,000<br>3 | 0,000<br>5 | 0,001<br>5 | 0,000<br>4 | 0,000<br>20 | 0,000<br>2 | 0,000<br>20 | 0,000<br>1 |
| <b>Cu-PHCE</b>       | CW022A    | min.    | 99,99                            | –          | –          | –           | –          | –           | –          | –          | –              | 0,001      | –          | –          | –          | –           | –          | –           | –          |
|                      |           | max.    | –                                | 0,002<br>5 | 0,000<br>5 | 0,000<br>20 | 0,000<br>1 | 0,0001<br>0 | 0,000<br>5 | 0,000<br>1 | – <sup>a</sup> | 0,006      | 0,000<br>5 | 0,001<br>5 | 0,000<br>4 | 0,000<br>20 | 0,000<br>2 | 0,000<br>20 | 0,000<br>1 |

<sup>a</sup> The oxygen content must be such that the material fulfills requirements of fragilization by heating in a hydrogen atmosphere, of the Norm in 1976.