

**SUPER PURE OXYGEN-FREE COPPER**  
**Chemical composition and Purity of Grade " A " ( basic )**

| SUPER PURE OXYGEN-FREE COPPER - Grade " A " ( basic ) according to GOST 859-2001, ASTM B 170.             |          |                       |           |                                      |     |          |       |          |            |     |      |
|---|----------|-----------------------|-----------|--------------------------------------|-----|----------|-------|----------|------------|-----|------|
| Impurity  | Method \ | LMS, AES              |           | LMS+AES+SSMS *+GDMS * ( mg/kg, ppm ) |     |          |       |          |            |     |      |
|   |          | Grade " A " ( basic ) |           | Grade " A " ( basic )                |     |          |       |          |            |     |      |
|   |          | min                   | max       | min                                  | ~   | median   | ~     | average  | max        |     |      |
| 1   | O        | ≤                     | 2         | ≤                                    | 2   | ≤        | 2     | ≤        | 2          |     |      |
| 2   | P        | <                     | 0.1       | <                                    | 0.1 | <        | 0.02  | <        | 0.05       |     |      |
| 3   | S        | <                     | 3         | <                                    | 3   | <        | 0.1   | <        | 0.4        |     |      |
| 4   | Mn       | <                     | 0.1       | <                                    | 0.1 | <        | 0.005 | <        | 0.02       |     |      |
| 5   | Fe       | <                     | 0.1       | 1                                    | <   | 0.01     | ≤     | 0.3      | <          | 0.4 | 1    |
| 6   | Ni       | <                     | 0.1       | <                                    | 0.1 | <        | 0.005 | <        | 0.005      | <   | 0.02 |
| 7   | Zn       | <                     | 0.1       | <                                    | 0.1 | <        | 0.02  | <        | 0.02       | <   | 0.02 |
| 8   | As       | <                     | 0.1       | <                                    | 0.1 | <        | 0.02  | <        | 0.02       | <   | 0.02 |
| 9   | Se       | <                     | 0.2       | <                                    | 0.2 | <        | 0.02  | <        | 0.05       | <   | 0.1  |
| 10  | Ag       | <                     | 0.1       | 2                                    | <   | 0.01     | ≤     | 0.6      | <          | 0.8 | 2    |
| 11  | Cd       | <                     | 0.2       | <                                    | 0.2 | <        | 0.005 | <        | 0.005      | <   | 0.02 |
| 12  | Sn       | <                     | 0.2       | <                                    | 0.2 | <        | 0.02  | <        | 0.02       | <   | 0.02 |
| 13  | Sb       | <                     | 0.2       | <                                    | 0.2 | <        | 0.02  | <        | 0.02       | <   | 0.02 |
| 14  | Te       | <                     | 0.2       | <                                    | 0.2 | <        | 0.02  | <        | 0.02       | <   | 0.02 |
| 15  | Pb       | <                     | 0.2       | <                                    | 0.2 | <        | 0.005 | <        | 0.005      | <   | 0.02 |
| 16  | Bi       | <                     | 0.2       | <                                    | 0.2 | <        | 0.005 | <        | 0.005      | <   | 0.02 |
|   | Fe + Ag  |                       | ≤         | 2.7                                  |     |          |       | ≤        | 2.7        |     |      |
| Oxygen is measured "not more 2 ppm" - a limit of the equipment , oxygen can be < 1 ppm and < 0.1-0.5 ppm. |          |                       |           |                                      |     |          |       |          |            |     |      |
| % wt  |          | max                   | min       | max                                  | ~   | median   | ~     | average  | min        |     |      |
| Cu  |          | ≥ 99.9993             | ≥ 99.9990 | ≥ 99.9998                            | ≥   | 99.9997  | ≥     | 99.9996  | ≥ 99.9995  |     |      |
| Cu + S  |          | ≥ 99.9996             | ≥ 99.9993 | ≥ 99.9998                            | ≥   | 99.9997  | ≥     | 99.9997  | ≥ 99.9995  |     |      |
| Cu + Ag   |          | ≥ 99.9993             | ≥ 99.9992 | ≥ 99.9998                            | ≥   | 99.9997  | ≥     | 99.9997  | ≥ 99.9996  |     |      |
| Cu + S + Ag   |          | ≥ 99.9996             | ≥ 99.9995 | ≥ 99.9998                            | ≥   | 99.9998  | ≥     | 99.9997  | ≥ 99.9997  |     |      |
| Cu+O  |          | ≥ 99.9995             | ≥ 99.9992 | ≥ 99.99997                           | ≥   | 99.99987 | ≥     | 99.99984 | ≥ 99.99966 |     |      |
| Cu+O + S  |          | ≥ 99.9998             | ≥ 99.9995 | ≥ 99.99998                           | ≥   | 99.99989 | ≥     | 99.99986 | ≥ 99.99970 |     |      |
| Cu+O + Ag   |          | ≥ 99.9995             | ≥ 99.9994 | ≥ 99.99997                           | ≥   | 99.99993 | ≥     | 99.99992 | ≥ 99.99983 |     |      |
| Cu+O + S + Ag   |          | ≥ 99.9998             | ≥ 99.9997 | ≥ 99.99998                           | ≥   | 99.99995 | ≥     | 99.99994 | ≥ 99.99987 |     |      |
| + According to Metals basis (All metals : > 60)   |          |                       |           |                                      |     |          |       |          |            |     |      |
| % wt  |          | max                   | min       | max                                  | ~   | median   | ~     | average  | min        |     |      |
| Cu  |          | ≥ 99.999              | ≥ 99.999  | ≥ 99.99996                           | ≥   | 99.99987 | ≥     | 99.99984 | ≥ 99.9997  |     |      |
| Cu + Ag   |          | ≥ 99.999              | ≥ 99.999  | ≥ 99.99996                           | ≥   | 99.99993 | ≥     | 99.99992 | ≥ 99.9998  |     |      |

\* Results are not for the best measurement, but for the sufficiently qualified measurement. Results are for lots. The buyer can specify the additional requirements if it is possible to measure it. Basic methods are LMS, AES. P.S. Limits of sensitivity " < x - < 0.00x " of the equipment/methods are considered at calculation of purity as corresponding number/quantity of impurity !