# WELDING ELECTRODE ALLOYS AND THEIR APPLICATIONS

## GROUP A – COPPER BASE ALLOYS

**CLASS 1** – Copper zirconium alloy that is superior to pure copper because of its higher annealing temperature, 350°C (662°F), while still maintaining comparable electrical and thermal conductivity. It is recommended for spot welding aluminum and magnesium alloys, coated material (terne plate, tin plate, galvanized iron, cadmium plate), brass and bronze.

**CLASS 2** – A chromium copper alloy most generally used for spot welding electrodes. This material is a precipitation hardened material having a high annealing temperature, 500°C (932°F). It is recommended for welding clean, low alloy steels, stainless steel, low conductivity brasses and nickel alloys.

**CLASS 3** – A beryllium free copper alloy possessing a combination of toughness, hardness and high resistance to annealing, 550°C (1022°F). It is recommended for welding stainless steel, monel metal and special welding components requiring high strength, wear resistance and good conductivity.

## GROUP B – COPPER TUNGSTEN ALLOYS, TUNGSTEN & MOLYBDENUM

Generally, this group of materials is recommended for electrode facings and welding dies. The hardness of these materials is unaffected by welding temperature; this quality gives them definite advantages where adequate cooling cannot be maintained.

**CLASS 11** – A tungsten copper alloy recommended as facings and inserts for flash and butt-welding dies and general purpose projection welding electrodes. It is recommended for high melting steels such as stainless steel.

**CLASS 13** – Pure Tungsten

This material does not alloy readily with non-ferrous metals and therefore is used in welding copper and brass. It is also used for electro-brazing electrodes. This material is not readily machinable.

**CLASS 14** – Pure Molybdenum

This material is used for electro-brazing and welding non-ferrous metals as is class 13. It is not as hard as tungsten, however it is readily machinable which may be advantageous.

**CLASS 20** – Dispersion strengthened copper (Glidcop)

This material has very high resistance to annealing (1000°C). Most commonly available in male/female caps yielding a long-life premium cap.

## PROPERTIES OF TYPICAL RWMA WELDING METALS

| ALLOY | | PRINCIPAL ELEMENTS | RWMA GROUP | HARDNESS ROCKWELL | ELECTRICAL CONDUCTIVITY % I.A.C.S. | ULTIMATE STRENGTH P.S.I. | ELONGATION % IN 2" | ANNEALING TEMP | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | °C | °F |
| CLASS 1 | WROUGHT | COPPER, ZIRCONIUM | A | 70B | 92 | 65000 | 18 | 350 | 662 |
| CLASS 2 | CAST | COPPER, CHROMIUM | A | 70B | 80 | 53000 | 17 | 500 | 932 |
| | WROUGHT | | | 80B | 80 | 72000 | 18 | 500 | 932 |
| CLASS 3 | CAST | COPPER, COBALT | A | 90B | 52 | 100000 | 12 | 550 | 1022 |
| | WROUGHT | | A | 90B | 52 | 110000 | 14 | 550 | 1022 |
| CLASS 11 | SINTERED | COPPER, TUNGSTEN | B | 98B | 46 | 90000 | - | - | - |
| CLASS 13 | CAST | TUNGSTEN | B | 70A | 32 | 100000 | - | - | - |
| CLASS 14 | CAST | MOLYBDENUM | B | 90B | 31 | 110000 | - | - | - |
| CLASS 20 | WROUGHT | COPPER, ALUMINIUM OXIDE | C | 75B | 85 | 54000 | 25 | 1000 | 1832 |