

STELLITE® 12 ALLOY

TECHNICAL DATA

TIG & OXY-ACETYLENE WELDING

MMA WELD DEPOSITION

MIG WELD DEPOSITION

PTA & LASER WELD DEPOSITION

HVOF & PLASMA SPRAY DEPOSITION

Nominal Composition (mass %) and Physical Properties

| Co | Cr | W | C | Others | Hardness | Density | Melting Range |
|------|-------|---------|---|-------------------|-------------------------|--|------------------------------|
| Base | 27-32 | 7.5-9.5 | 1.4-1.7 (hardfacings) 1.7-2.0 (castings) | Ni, Fe, Si, Mn | 45-51 HRC 435-590 HV | 8.53 g/cm ³ 0.308 lb/in ³ | 2192-2489 °F 1200-1365 °C |

Stellite® cobalt base alloys consist of complex carbides in an alloy matrix. They are resistant to wear, galling and corrosion and retain these properties at high temperatures. Their exceptional wear resistance is due mainly to the unique inherent characteristics of the hard carbide phase dispersed in a CoCr alloy matrix.

Stellite® 12 could be considered an intermediate alloy between Stellite® 6 and Stellite® 1. It contains a higher fraction of hard, brittle carbides than Stellite® 6, and has increased resistance to low-angle erosion, abrasion, and severe sliding wear whilst retaining reasonable impact and cavitation resistance.

Stellite® 12 is often used self-mated or running against Stellite® 6 or Stellite® 1.

The higher tungsten content provides better high-temperature properties compared to Stellite® 6, and it can be used at temperatures up to about 700°C.

Stellite® 12 is typically used for cutting tools that need to withstand abrasion, heat and corrosion. Examples include industrial knives for cutting carpets, plastics, paper and synthetic fibres; and saw tips in the timber industry. It is also used for control plates in the beverage industry, pump vanes, bearing bushes and narrow-neck glass mold plungers; and for hardfacing of engine valves, pinch rollers in the metal-processing industries, and rotor blade edges.

Corrosion Resistance

The typical electrode potential in sea water at room temperature is approximately -0.3 V (SCE). Like stainless steels, Stellite® 12 corrodes primarily by a pitting mechanism and not by general mass loss in seawater and chloride solutions. Information regarding corrosion resistance in other corrosive environments can be provided on request.



Optical Micrograph of a Stellite® 12 PTA Deposit at 500X.

Nominal Thermal Expansion Coefficient (from 20°C to stated temperature)

| | 100° C (212°F) | 200° C (392°F) | 300° C (572°F) | 400° C (752°F) | 500° C (932°F) | 600° C (1112°F) | 700° C (1292°F) | 800° C (1472°F) | 900° C (1652°F) | 1000° C (1832°F) |
|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|---------------------|
| µm/m.K | 11.5 | 12.1 | 12.6 | 12.9 | 13.3 | 13.8 | 14.3 | 14.8 | 15.2 | 15.6 |
| µ-inch/inch-°F | 6.4 | 6.7 | 7.0 | 7.2 | 7.4 | 7.7 | 7.95 | 8.2 | 8.45 | 8.7 |

Nominal Tensile Properties at Room Temperature

| | Ultimate Tensile Strength Rm | | Yield Stress Rp(0.2%) | | Elongation | Elastic Modulus | |
|---------------------|------------------------------|------|------------------------|-----|------------|----------------------|-----|
| | ksi | MPa | ksi | MPa | A(%) | psi | GPa |
| Castings | 107 | 740 | 84 | 580 | <1 | 32.8x10 ⁶ | 226 |
| Stellite® HS-12 (*) | 174 | 1200 | 130 | 900 | 2 | 30.1x10 ⁶ | 208 |

(*) "HS" = HIP -consolidated from the powder form.

Nominal Hot Hardness (DPH) as-cast

| 20° C (68°F) | 100° C (212°F) | 200° C (392°F) | 300° C (572°F) | 400° C (752°F) | 500° C (932°F) | 600° C (1112°F) | 700° C (1292°F) | 800° C (1472°F) | 900° C (1652°F) |
|-----------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|
| 546 | 456 | 418 | 390 | 380 | 371 | 362 | 328 | 232 | 153 |

Thermal and Electrical Properties

| | Approximate value at Room Temperature | |
|------------------------|---------------------------------------|---------------------|
| Thermal conductivity | 14.6 W/m.K | 100 Btu-in/hr/ft²°F |
| Electrical resistivity | 98 µ-ohm.cm | 38.6 µ-ohm.inch |

Product Forms and Cross Reference Specifications

Stellite® 12 is available as welding wire, rod, powder, and electrodes; finished castings and P/M parts. Deloro Stellite also offers hardfacing services. Stellite® 12 can be supplied to the following specifications:

| SPECIFICATION | PRODUCT FORM | SPECIFICATION | PRODUCT FORM |
|---------------|---------------|---|--------------|
| UNS R30012 | Rod, Castings | AWS A5.21 / ASME BPVC IIC SF A 5.21 ERCoCr-B | Rod |
| UNS W73012 | Electrode | AWS A5.21 / ASME BPVC IIC SF A 5.21 ERCCoCr-B | Wire |
| UNS W73042 | Wire | AWS A5.13 / ASME BPVC IIC SF A 5.13 ECoCr-B | Electrode |

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