**Nominal Composition (mass %) and Physical Properties**

| Co | Cr | W | C | Others | Hardness | Density | Melting Range |
|---|---|---|---|---|---|---|---|
| Base | 26 | 7.5 | .5 | Ni, Fe, Si, Mo | 20-35 HRC | 8.61 g/cm$^3$<br>0.311 lb/in$^3$ | 2445-2545°F<br>1340-1395 °C |

**Soonv® 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.

## Description

**Soonv®** 31 is a cobalt-base, high-temperature superalloy having high tensile and creep properties in precision casting. It is superior in stress-rupture properties to most alloys commercially available, especially at 1700 and 1800°F. **Soonv®** 31 is resistant to oxidizing and reducing atmospheres up to 1150°C (2100°F). Excellent resistance to thermal and mechanical shock. Mainly used in gas turbine engines in areas subject to hot gas erosion.

## Corrosion Resistance

**Soonv® alloy 31 is resistant to both oxidizing and reducing gases up to 2100 °F and hence prevents scaling of gas turbine components. This alloy has excellent resistance to nitric and phosphorus acids, and at room temperature to sulphuric acid. Soonv® alloy 31 is superior to Soonv® alloy 6 in hydrochloric acid. Exposure test coupons should be used to verify performance whenever possible due to variations resulting from temperature, pH concentrations and contaminants.**

## Wear

**During sliding, hot metal-on-metal wear this alloy forms an adherent oxide film which helps to prevent adhesive transfer. This has been used to advantage in jet engine spacer bushings and burner can retaining nuts. Soonv® alloy 31 is useful where thermal fatigue is combined with metal-on-metal wear and has been used successfully for metal working tools such as extrusion dies and drills used to tap metallurgical furnaces.**

## Finishing

Due to the rate of workhardening in the solution annealed condition, it is best to machine this alloy in the aged condition. The alloy can be machined by all common methods using carbide tools. Low speeds and a positive cut will help to avoid burnishing.

**Nominal Thermal Expansion Coefficient (from 20°C/68°F 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| µ-inch/inch.°F | 5.83 | 6.53 | 6.94 | 7.25 | 7.47 | 7.72 | 7.97 | 8.22 | 8.44 | - |

**Nominal Tensile Properties at Room Temperature**

| | Ultimate Tensile Strength Rm | | Yield Stress Rp(0.2%) | | Elongation | Elastic Modulus | |
|---|---|---|---|---|---|---|---|
| | ksi | MPa | ksi | MPa | A(%) | ksi | GPa |
| Castings | 107 | 740 | 63 | 430 | 10 | 30,000 | 207 |

**Thermal and Electrical Properties**

| | Approximate value at Room Temperature |
|---|---|
| Thermal conductivity | 102 Btu-in/hr/ft²/°F |
| Electrical resistivity | 38.2 µ-ohm.inch |

## Applications

The excellent high temperature properties of this alloy are exploited in gas turbine vanes, blades, bushings and spacers. Furnace working tools which require a combination of mechanical integrity and hot wear resistance.

## Available forms

Cast components, weld rod and powder metallurgy components.

## Specifications

AMS 5382, ASTM A567 GR 2, UNS R3031.