TECHNICAL DATA SHEET

ALLOY 6B

UNS R30016/AMS 5894

Description

Alloy 6B is a cobalt-based alloy with great wear, erosion and abrasion resistance. The wear resistance of alloy 6B is due to its chemical composition and is not a product of heat treatment or other hardening mechanisms. The low coefficient of friction of alloy 6B allows it to resist seizing and galling; proving useful in areas and applications where lubrication is difficult or impractical. Even under constant erosive conditions, alloy 6B has shown exceptional cavitation erosion resistance. Elevated temperature exposure has little effect on this alloy's hardness, impact strength, and dimensional stability. Alloy 6B also maintains high hardness at elevated temperatures (approaching 2000°F) and will recover its original hardness upon cooling to room temperature. This unique property, coupled with good corrosion resistance to a multitude of media and superior mechanical properties in relation to its outstanding wear resistant characteristics, makes alloy 6B a versatile alloy that can be used in numerous applications where wear, corrosion and elevated temperature are concerns.

Industries and Applications

Alloy 6B is suitable for use in a variety of high wear and erosion applications. The abrasion resistance of this alloy allows it to be used as industrial scraper blades and knives in the food processing, waste water treatment and textile industries. Alloy 6B is used in applications where erosion is an issue such as nozzles, pumps, valves and mixing blades that are moving slurries where cavitation damage is a concern. This alloy has also found use in industrial sliding wear applications such as valves in chemical processing and turbine blade components for steam control in the power industry. Alloy 6B can also be found in bearing assemblies in heat treat furnaces.

Resistance to Corrosion

Alloy 6B also has corrosion resistance in a variety of media in addition to being wear resistant. Chromium, molybdenum, tungsten and nickel all provide additional resistance against corrosion. Alloy 6B is very resistant to oxidation at ambient temperatures and has good resistance to oxidation at elevated temperatures. Alloy 6B is resistant to different aqueous corrosive media at various concentration and temperature combinations. See the table on the next page for specifics.

Fabrication and Heat Treatment

The carbon content in alloy 6B may make it more difficult to machine compared to other cobalt based alloys, but tungsten carbide tools can still be used to machine this alloy. High speed inserts are not recommended but EDM techniques can be used to make threads in this alloy. Alloy 6B can be welded using a range of methods, including TIG, MIG, shielded metal arc and coated electrode welding. A preheat treatment to 1000°F should be used and maintained to prevent cracking during welding. Ventilation is needed to minimize exposure to airborne dust, fumes, and particulate matter when machining, grinding or welding this alloy. The standard heat treatment for alloy 6B is 2250°F (1232°C) followed by an air cool.

Chemical Composition (%)

(Co) Cobalt	Remainder
(Cr) Chromium	28.0 - 32.0
(W) Tungsten	3.5 - 5.50
(Fe) Iron	3.0 max
(Ni) Nickel	3.0 max
(Mo) Molybdenum	1.5 max
(Mn) Manganese	0.5 - 2.0
(Si) Silicon	0.2 - 2.0
(C) Carbon	0.9 - 1.40
(P) Phosphorus	0.04 max
(S) Sulfur	0.03 max

Physical Properties

Density	0.303 lb/in.^{3}
Elastic Modulus @ Room Temp.	30.4 x 10^3 ksi
Melting Range	2310°F to 2470°F
Specific Heat	0.101 Btu/lb•°F
Magnetic Permeability	<1.2@200 Oersteds
Electrical Conductivity	1.9% IACS
Electrical Resistivity	35.83 µΩ•in
Thermal Conductivity @ 70°F	103 Btu•in/ft^2•h•°F
Coefficient of Thermal Expansion @ 32°F to 212°F	7.7 µin/in•°F

Mechanical Properties[1]

Hardness	37 - 43 HRC
Yield Strength	70 ksi
Tensile Strength	130 ksi
Elongation	5%
Reduction of Area	7%

[1]*Based on limitations from AMS 5894, all values are minimums unless listed otherwise*

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Aqueous Corrosion Data[1]

Media	Concentration % by weight	Test Temp. °F (°C)	Average Penetration Rate per Year mils	mm
Acetic Acid	10	Boiling	0.08	0.002
Acetic Acid	50	Boiling	0.02	<0.001
Acetic Acid	99	Boiling	0.03	<0.001
Chromic	10	150 (66)	95	2.41
Formic Acid	10	Boiling	20	0.51
Formic Acid	30	Boiling	26	0.66
Formic Acid	70	Boiling	50	1.27
Hydrochloric Acid	2	Room	0.1	<0.003
Hydrochloric Acid	5	Room	63	1.60
Hydrochloric Acid	10	Room	108	2.74
Hydrochloric Acid	2	150(66)	0.1	<0.003
Hydrochloric Acid	5	150(66)	>1000	>25.4
Nitric Acid	10	Boiling	0.15	<0.004
Nitric Acid	30	Boiling	6	0.15
Nitric Acid	50	Boiling	>1000	>25.4
Phosphoric Acid	10	Boiling	Nil	Nil
Phosphoric Acid	30	Boiling	2	0.05
Phosphoric Acid	50	Boiling	19	0.48
Phosphoric Acid	85	Boiling	611	15.5
Sodium Hydroxide	30	Boiling	13	0.33
Sulfuric Acid	10	Room	0.02	<0.001
Sulfuric Acid	50	Room	0.4	0.01
Sulfuric Acid	77	Room	0.7	0.02
Sulfuric Acid	10	150(66)	0.02	<0.001
Sulfuric Acid	30	150(66)	0.09	<0.003
Sulfuric Acid	50	150(66)	>1000	>25.4

[1]Data determined in laboratory tests presented by Deloro Stellite. It is recommended that samples be tested under actual conditions.

Hot Hardness

Test Temperature °F (°C)	Brinell Hardness
1000 (538)	226
1200 (649)	203
1400 (760)	167
1600 (871)	102

Typical Charpy Impact Strength

Test Temperature °F	Type	Impact Strength (avg) ft*lbs
Room	Un-notched	72
	Notched	6
1000	Un-notched	81
	Notched	15
1250	Un-notched	116
	Notched	15
1500	Un-notched	126
	Notched	15

Applicable Specifications

Form	AMS	Other
Bar	AMS 5894	Deloro W3
Sheet/Plate	AMS 5894	Deloro W1

Please contact Corrosion Materials for a complete list of items available from our extensive inventory, as well as our value-added processing services.

We supply a complete range of items in many alloys, including C-276, 22, B-2, B-3®, 200/201, 400, 405, K-500, 625, 600, 800H/HT®, 20, F255, 6B, Titanium Gr. 2 and Titanium Gr. 5.

Our machine shop, welding shop and processing departments are equipped with state-of-the-art manufacturing equipment allowing Corrosion Materials the ability to provide the service you desire along with the economic and technical advantages you need and deserve.

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