DATA SHEET

ALLOY 20

UNS No - N08020

Other common names: Carpenter 20, 20Cb-3®, Incoloy® alloy 20

Alloy 20, also called as Carpenter 20, is a nickel-iron-chromium austenitic alloy that was created for maximum resistance to acid attack, especially sulfuric acid. This super alloy has a magnificent resistance to general corrosion; pitting and crevice corrosion in chemicals involves chlorides and sulfuric, phosphoric and nitric acids. It also includes niobium for adjustment against sensitization and resultant intergranular corrosion. Carpenter 20 joins magnificent corrosion resistance with high mechanical properties and relatively simple fabrication. Although initially intended for use in sulfuric acid related industries, Alloy 20 is currently a popular choice for a wide variety of industries which includes pharmaceutical, chemical, food as well as plastics industries. Moreover, this super alloy is utilized in heat exchangers, mixing tanks, metal cleaning, pickling equipment and piping. There has been a long debate on whether Carpenter 20 is a stainless steel or a nickel alloy because the nickel content is right on the border of defining it as one way or the other. Thus, contingent upon whom you converse with this alloy might be alluded to as Alloy 20 Stainless Steel or as a nickel alloy. Whichever way it is still extraordinary for corrosion resistance.

Applications

- Synthetic rubber manufacturing equipment
- Processing of pharmaceuticals, plastics and organic and heavy chemicals
- Tanks, piping, heat exchangers, pumps, valves, and other process equipment
- Acid cleaning and pickling equipment
- Chemical process piping, reactor vessels
- Bubble caps
- Petrochemical process equipment
- Food and dye production

Characteristics

- Excellent general corrosion resistance to sulfuric acid
- Excellent resistance to chloride stress corrosion cracking
- Excellent mechanical properties and fabricability
- Minimal carbide precipitation during welding
- Excels in resisting corrosion to hot sulfuric acids

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Machining
Prevalent completions might be obtained by utilizing set-up and prepare speeds and feeds ordinarily utilized in austenitic stainless steels for example, 316 and 317. Slow speeds and heavy, constant feeds are the standards in working this alloy.

Forming
In forming, to acquire most extreme ductility, heat material to 2100 F (1149 C). See, in any case, this process will adversely affect the stability of the material. Without this process, the material can be acceptably formed yet with a high work hardening rate.

Welding
Most generally utilized welding techniques with the exception of oxyacetylene welding have been effectively utilized with this alloy. The presence of columbium tends to minimize the precipitation of carbides in the heat affected area, so the material may, in most cases, be utilized as a part of the “as welded” condition. Pre-heating is not required.

Heat Treatment
Type 20 CB-3 is not hardenable by heat treatment.

Forging
Soak thoroughly at 2100-2250 F (1149-1232 C). Re-heat when temperature drops below 1800 F (982 C). After forging, reheat and soak completely at 1725-1850 F (941-1010 C) and quench quickly in water or oil.

Hot Working
This alloy can be successfully hot formed with the help of forces similar to those required by austenitic stainless steels.

Cold Working
This alloy can be successfully cold formed with the help of all common practices. Its high strength may require higher forming pressures.

Annealing
Soak completely at 1725-1850 F (941-1010 C), water quench.

Hardening
This material might be hardened by cold work.

Chemical Properties

C	Si	P	S	Cr	Mn	Fe	Ni	Cu	Mo	Cb (Nb+Ta)
0.07 Max	1.0 max	0.045 max	0.035 max	19.0 - 21.0	2.0 max	Remainder	32.0 - 38.0	3.0 - 4.0	2.0 - 3.0	(8 x C) - 1.0 max

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Mechanical Properties

Tensile Strength (ksi)	0.2% Yield Strength (ksi)	Elongation% in 2 inches
80	35	30

Physical Properties

Properties	Units	Temperature in °C
Density	8.08 g/cm^3	Room
Specific Heat	0.12 Kcal/kg.C	22°
Melting Range	1385-1443 °C	-
Modulus of Elasticity	193 KN/mm^2	22°
Electrical Resistivity	108 µΩ.cm	Room
Coefficient of Expansion	14.69 µm/m °C	20-100°
Thermal Conductivity	11.59 W/m-°K	20°

ASTM Specifications

Pipe / Tube (SMLS)	Pipe Welded	Tube Welded	Sheet / Plate / Strip	Bar	Forging	Fitting	Wire
B 729	B 464	B 468	B 463	B 473	B 462	B 366	B 473

Availability

MANUFACTURING	RAW MATERIALS
Fasteners	Pipes
Custom Machining	Tubes
Custom Fabrication	Bars
Piping / Spools	Wires
Stamped Parts	Sheets
B/W Fittings	Plates
S/W Fittings	-
Flanges	-
Compression Fittings	-