



Alloy 20

UNS N08020/ W.Nr. 2.4660



"ISO 9001-2008 Certified
ISO Registered Since 1993"

Alloy 20 is an iron-base, austenitic alloy with excellent corrosion resistance to a number of different media and proves to be useful in a number of applications such as flue-gas desulfurization, chemical processing, food processing and storage as well as pharmaceutical applications to name a few. Application of the alloy could result in real cost savings when carefully compared to higher-cost alloys to determine if the necessary resistance is obtained in the chosen media. Applications are limited to a maximum temperature of 1000°F per ASME.

Resistance to Corrosion

Resistance to sulfuric acid is particularly exceptional but the alloy shows useful resistance in phosphoric acid, nitric acid as well as in chloride environments. Alloy 20 is an excellent option when chloride stress corrosion cracking is an issue and resists pitting and crevice corrosion.

Fabrication and Heat Treatment

Alloy 20 can be formed by either hot-working or cold-work using traditional methods. Hot forged material should be heated between 2100°F and 2250°F with careful temperature control insuring that the material not fall below 1800°F prior to forging. After hot working, anneal the material by heating to 1725°F and 1850°F for a minimum of 30 minutes per inch of thickness followed by water quench.

When stress relieving is desired, heat to a temperature below 1000°F followed by water quench after the desired time at temperature has been established. Annealing Alloy 20 should be between 1725°F and 1850°F for 30 minutes at temperature per inch of thickness. A lower hardness can be obtained by heating to 2100°F but this may have a negative effect on the stabilization of the alloy.

Welding Alloy 20 is commonly performed via, TIG, MIG as well as submerged arc welding (SAW) using either the matching filler metal, ER320LR for TIG and MIG and E320LR for SAW. When welding to dissimilar alloys such as 316 or higher alloys such as C276 and Alloy 22, AWS ERNiCrMo-3 can be used for TIG and MIG while using ENiCrMo-3 for SAW.

Chemical Composition

Fe	Balance
Ni	32.00% to 38.00%
Cr	19.00% to 21.00%
Mo	2.00% to 3.00%
Cu	3.00% to 4.00%
Cb + Ta	(8 x C%) to 1.00%
Mn	2.00% Maximum
Si	1.00% Maximum
P	0.045% Maximum
S	0.035% Maximum
C	0.07% Maximum

Physical Properties

Density @ Room Temp.	0.292 lb/in. ³
Poisson's Ratio	0.31
Modulus of Elasticity (Tension)	28.0 X 10 ³ ksi
Modulus of Rigidity	11.0 X 10 ³ ksi
Specific Heat (32/212°F)	0.12 Btu/lb•°F
Electrical Resistivity (RT)	651 ohm-cir mil/ft
Magnetic Permeability (Annealed)	1.002 @ 200Oe

Coefficient of Thermal Expansion

77°F to 212°F	8.16 x 10 ⁻⁶ in./in. •°F
77°F to 302°F	8.27 x 10 ⁻⁶ in./in. •°F
77°F to 392°F	8.37 x 10 ⁻⁶ in./in. •°F
77°F to 662°F	8.71 x 10 ⁻⁶ in./in. •°F
77°F to 842°F	8.84 x 10 ⁻⁶ in./in. •°F
77°F to 932°F	8.91 x 10 ⁻⁶ in./in. •°F
77°F to 1652°F	9.53 x 10 ⁻⁶ in./in. •°F

Thermal Conductivity @ 68°F

@ 122°F	84.6 Btu•in./ft ² •h•°F
@ 212°F	90.8 Btu•in./ft ² •h•°F
@ 392°F	103.0 Btu•in./ft ² •h•°F
@ 572°F	114.0 Btu•in./ft ² •h•°F
@ 752°F	126.0 Btu•in./ft ² •h•°F

Mechanical Properties¹

Annealed Material				
Product Form	Tensile Minimum	Yield Minimum (0.2% offset)	Elongation Minimum	Reduction of Area Minimum
Bar (hot or cold finished)	80 ksi	35 ksi	30%	50%
Sheet/Plate ²	80 ksi	35 ksi	30%	-

1. According to applicable ASTM specifications. 2. Maximum allowable hardness, 217 Brinell (95 Rockwell B scale).

Aqueous Corrosion Data¹

Media	Common Name	Corrosion Rate (mpy)
10% H ₂ SO ₄	Sulfuric Acid	13.2
20% H ₂ SO ₄	Sulfuric Acid	8.4
40% H ₂ SO ₄	Sulfuric Acid	6.0
70% H ₂ SO ₄ @ 167°F	Sulfuric Acid	5
90% H ₂ SO ₄ @ 140°F	Sulfuric Acid	4
90% H ₂ SO ₄ @ 185°F	Sulfuric Acid	15
90% H ₂ SO ₄ @ 203°F	Sulfuric Acid	27
10% H ₃ NO ₃ S	Sulfamic Acid	9.6
1% HCl	Hydrochloric Acid	39.6
20% C ₂ H ₄ O ₂	Acetic Acid	0.0
45% CH ₂ O ₂	Formic Acid	8.4
10% C ₂ H ₂ O ₄	Oxalic Acid	31.2
50% NaOH	Sodium Hydroxide	7.2
10% NaHSO ₄	Sodium Bisulfate	7.2
20% H ₃ PO ₃	Phosphoric Acid	0.2

1. All solutions at boiling during testing unless specified.

Applicable Specifications

Alloy 20 - Form	ASTM	ASME	European Standard
Bar	B473	SB473	EN 10204-3.1
Sheet & Plate	B463	SB463	EN 10204-3.1
Seamless Pipe & Tube	B729	-	EN 10204-3.1
Welded Pipe	B464, B474 ¹	SB464	EN 10204-3.1
Welded Tube	B468	SB468	EN 10204-3.1

1. Electric fusion welded pipe material only.

Please contact Corrosion Materials for a complete list of available items from inventory.

In-house machine and weld facilities help insure that the most common items will be in stock. Items not in stock can be fabricated in a short period of time either in-house or through our extensive, approved subcontractor and supplier network.

We also supply a complete range of items in the following alloys: Alloy C276, B2, B-3[®], F-255, Alloy 22, 625, 200/201, Alloy 400, 405 and 600. Bar products are also available in K500, Alloy 800H/HT[®], and Alloy 6B as well as various Ti grades.

(800HT[®] is a registered trademark of Special Metals Corporation. B-3[®] is a registered trademark of Haynes International Inc.)

The data and information contained in this pamphlet have been taken from open literature and is believed to be reliable. The information contained is intended to be used as a guide. Corrosion Materials does not make any warranty or assume any legal liability for its accuracy, completeness or usefulness.

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