



CORROSION MATERIALS

"Your Corrosion Alloy Specialist"



"ISO 9001-2008 Certified
ISO Registered Since 1993"

Alloy 400 is a single phase, solid-solution alloy that offers superior resistance to many corrosive environments over a temperature range from sub-zero to 800°F. Alloy 400 has been widely used in many applications but has been particularly useful in marine and chemical processing. Typical applications include valves; pumps and propeller shafts; marine fixtures and fasteners; electrical and electronic components; springs; chemical processing equipment; gasoline and fresh water tanks; crude petroleum stills, process vessels and piping; boiler feedwater heaters and heat exchangers; and deaerating heaters.

Alloy 400

UNS N04400 / W.Nr. 2.4360 & 2.4361

Chemical Composition

Ni.....	63.0 to 70.0	Si	0.50 Max.
Fe	2.50 Max.	Cu.....	Remainder
C	0.3 Max.	S	0.024 Max.
Mn.....	2.00 Max.		

Physical Properties

Density@ Room Temp.	0.318 lb/in. ³
Elastic Modulus @ 70°F (tension)	26.0 x 10 ⁶ psi
Melting Point	2370°F to 2460°F
Specific Heat @ 70°F	0.102 Btu/lb/°F
Thermal Conductivity @ 70°F	151 Btu·in/h/ft ² /°F
Electrical Resistivity @ 70°F	0.511 μΩ·m

Mechanical Properties

Typical Room Temperature Tensile Properties of Annealed Material

Product Form	Condition	Tensile (ksi)	0.2% Yield (ksi)	Elongation (%)	Hardness (HRB)
Rod & Bar	Annealed	75 to 90	25 to 50	60 to 35	60 to 80
Rod & Bar	Cold-Drawn/Stress Relieved	84 to 120	55 to 100	40 to 22	85 to 20 HRC
Plate	Annealed	70 to 85	28 to 50	50 to 35	60 to 76
Sheet	Annealed	70 to 85	30 to 45	45 to 35	65 to 80
Tube & Pipe - Seamless	Annealed	70 to 85	25 to 45	50 to 35	75 Max. ¹

1. The ranges shown are composites for various product sizes and therefore are not suitable for specification purposes. Hardness values are suitable for specification purposes provided tensile properties are not also specified.

Resistance to Corrosion

Alloy 400 exhibits resistance to corrosion by many reducing media. Also, it is one of the few alloys that can be used in contact with fluorine, hydrofluoric acid, hydrogen fluoride or their derivatives. Exceptional resistance has been proven in hydrofluoric acid in all concentrations up to the boiling point. Alloy 400 is also resistant to many forms of sulfuric and hydrochloric acids under reducing conditions. Behavior in seawater is also excellent.

Fabrication and Heat Treatment

Typical shaping, forming, machining and joining operations for Alloy 400 can be used in fabrication. Hot working operations should be performed between 1200°F and 2150°F. For heavy reductions a temperature between 1700°F and 2150°F should be used. Cold working should be performed on annealed material.

Heat treatments available to Alloy 400 are stress equalizing, stress relieving and annealing depending on the mechanical properties desired. Stress equalizing is performed at a temperature of 575°F

High Temperature Properties

Annealed Material

Temperature (°F)	0.2% Yield (ksi)	Tensile (ksi)
200	21.9	61
400	19.6	56
600	18.9	55
800	18.9	52

for a period of 3 hours followed by a rapid quench. This causes an increase in yield strength with no effects on other properties. Stress relieving is achieved at a temperature between 1000°F and 1050°F for a period of 1 to 2 hours followed by slow cooling. This will reduce stresses without producing a recrystallized grain structure and is recommended to obtain minimum distortion after metal removal. Annealing will completely soften work hardened material and is performed by holding at temperatures between 1600°F and 1800°F for 2 to 10 minutes followed by rapid quench.

Aqueous Corrosion Data

Media	Common Name	Temp. °F (°C)	Corrosion Rate (mpy)
C ₂ H ₄ O ₂ - All Concentrations	Acetic Acid	70 (21)	<4
4% NaOH	Caustic	68 (20)	0.16
23% NaOH	Caustic	220 (104)	0.2
50% NaOH	Caustic	Boiling	<1
75% NaOH	Caustic	275 (135)	1.7
40% CH ₂ O ₂	Formic Acid	Boiling	2.7
0.5% HCl - No Aeration	Hydrochloric Acid	Boiling	29
1% HCl - No Aeration	Hydrochloric Acid	Boiling	42
5% HCl - No Aeration	Hydrochloric Acid	Boiling	44
Up to 10% HCl	Hydrochloric Acid	86 (30)	<10
12% HF	Hydrofluoric Acid	182 (83)	22
25% HF - Saturated w/Air	Hydrofluoric Acid	86 (30)	37
25% HF - Purged w/Nitrogen	Hydrofluoric Acid	86 (30)	0.2
50% HF - Saturated w/Air	Hydrofluoric Acid	176 (80)	39
50% HF - Purged w/Nitrogen	Hydrofluoric Acid	176 (80)	0.5
Anhydrous HF	Hydrofluoric Acid	80 (27)	3.2
Anhydrous HF	Hydrofluoric Acid	200 (88)	4.7
HF	Hydrogen Flouride Gas	1112 (600)	13
H ₃ PO ₄ - All Concentrations	Phosphoric Acid	To 176 (80)	<10
KOH	Potash Liquor	235 (113)	0.6
5% H ₂ SO ₄	Sulfuric Acid	214 (101)	3.4
9% H ₂ SO ₄	Sulfuric Acid	219 (104)	7.5
50% H ₂ SO ₄	Sulfuric Acid	253 (123)	650
96% H ₂ SO ₄	Sulfuric Acid	560 (293)	3300

Applicable Specifications

Alloy 400 - Form	ASTM	ASME	British Standard	Federal Specification	European Standard	Other
Bar ¹	B164, B564 ²	SB164, SB564 ²	BS3076-NA13	QQN281 ³	EN 10204-3.1.B	/
Plate	A480 ⁴ , B127	SB127	BS3072-NA13	QQN281 ⁵	EN 10204-3.1.B	/
Sheet	A480 ⁴ , B127	SB127	BS3072-NA13	QQN281 ⁶	EN 10204-3.1.B	/
Seamless Tube & Pipe ⁷	B165	SB165	BS3074-NA13	/	EN 10204-3.1.B	MIL-T-1368C
Welded Pipe ^{7,8}	B725	SB725	BS3076-NA13	/	EN 10204-3.1.B	
Wire	/	SFA 5.14	/	/	EN 10204-3.1.B	AWS A-5.14

1. Sizes up to 3", cold-drawn/stress-relieved. 3 1/4" and above, hot-formed/stress-relieved. 2. Dual certified on diameters including and above 3 1/2" in diameter 3. Class A, Form 1, Amendment II. 4. Flatness specification 5. Amendment II, Form 6 - Hot Rolled/Annealed. 6. Amendment II, Form 4 - Cold-Rolled/Annealed. 7. Annealed 8. No addition of filler metal.

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.

Baker

2262 Groom Rd.
P.O. Box 630
Baker, Louisiana 70714
(800) 535-8032
(225) 775-3675
FAX: (225) 774-0514

Chicago

375 W. South Frontage Rd.
Bolingbrook, Illinois 60440
(800) 706-7471
(630) 226-1043
FAX: (630) 226-1044

Houston

12305 Cutten Rd.
Houston, Texas 77066
(800) 455-2276
(713) 939-0364
FAX: (713) 939-1126

Shanghai

Room 1202
333 Jiujiang Road
Shanghai, China 200001
86-21-6045 2221/2223
Fax: 86-21-6045 2225

24-Hour Emergency Service

www.corrosionmaterials.com

Pricing & Documents Available on Our Website