

Specification Equivalents

Alloy No.	Specification
Class II Chromium Copper (C18200)	R.W.M.A., Group A SAE J463, J461, MIL-C-19311

Chemical Composition % by Weight

UNS No.	Chromium	Lead	Iron	Silicon	Zinc	Copper
C18200	0.6-1.2	0.05 Max	0.10 Max	0.10 Max	-	Balance

Corrosion Resistance

In general, this alloy has the same corrosion resistance as pure copper. As a result, mercury and ammonia compounds, as well as nitric acid, should be avoided.

**Chromium Copper
Physical Properties (C18200)**

Density	0.321 lb/in ³	8.89 g/cm ³
Coefficient of thermal expansion (68 to 212 F, 20 to 100 C)	9.8 x 10 ⁻⁶ F ⁻¹	17.6 x 10 ⁻⁶ C ⁻¹
Thermal Conductivity (68 F, 20 C)	187 BTU/ft•hr•F	325 W/m•C
Electrical Conductivity	80% IACS (67 F, 20 C)	.46 Megmho/cm
Melting Temperature	1960 F	1070C

Machining

Chrome copper is easily machined with either high speed steel or carbide tools. Standard, off-the-shelf tools are recommended for all general machining operations.

Turning tools should be ground with generous positive rake angles to minimize cutting resistance. Mineral oil and water-soluble cutting fluids are recommended to improve tool life and surface finish.



Minimum Mechanical Properties

Diameter or Distance Across Flats	Ultimate Tensile Strength (ksi)	Elongation (% in 2")	Rockwell Hardness B Scale
Rod (Round & Hex)			
Up to 1 inch	65	9	75
Over 1 inch to 2 inches	60	10	70
Over 2 inches to 3"	55	12	65
Over 3 inches	50	12	60
Bar			
Thickness up to 1 inch	60	8	70
Width up to 1 inch			
Thickness over 1" to 2"	55	12	65
Width over 2 inches			
Thickness over 2 inches	50	19	60
Width over 3 inches			

Note: Available in AT or HT temper depending upon size.

Workability

Chromium Copper Alloy C18200 is usually supplied in the cold drawn and heat treated condition. In this condition, this alloy is suited for moderate cold working, such as bending.



Forms and Tempers
Most Commonly Used

	Annealed Tempers							Rolled or Drawn Tempers					Hot Finished Tempers				
	Nominal Grain Size mm							Solution Heat Treated	Solution Heat Treated and Cold Worked	Solution Heat Treated, Cold Worked and Aged	Solution Heat Treated, Cold Worked, Aged, and Cold Worked	Solution Heat Treated and Aged	Mill Annealed	Mill Annealed and Cold Worked	As Hot Rolled	As Extruded	Special Tempers
	.100	.070	.050	.035	.025	.015	Soft Anneal											Light Anneal
FLAT PRODUCTS	Strip, Rolled							•	•	•			•				
	Strip, Drawn																
	Flat Wire, Rolled																
	Flat Wire, Drawn																
	Bar, Rolled																
	Bar, Drawn														•		
	Sheet																
	Plate							•	•	•				•			
	ROD							•	•	•				•	•		
	WIRE							•	•	•				•	•		
	TUBE									•				•			
PIPE													•				
SHAPES																•	

Mechanical Properties

Form	Size Section in.	Temper	Tensile Strength ksi	Yield Strength		Elongation in 2 in. %	Rockwell Hardness			Shear Strength ksi	Fatigue Strength	
				(.5 Ext. under Load) ksi	(.2% Offset) ksi		F	B	30T		ksi	Million Cycles
FLAT PRODUCTS	.040 in.	Solution Heat Treated	34.0	19.0	....	40	—	16	—	...	....	....
		Solution Heat Treated and Aged (500C-3 hrs)	51.0	36.0	...	22	—	59	—	...	....	....
		Solution Heat Treated and Cold Worked (50%)	53.0	51.0	....	6	—	66	—	...	....	....
PLATE	2.0 in.	Solution Heat Treated, Cold Worked (50%), and Aged (450C-3 hrs)	67.0	59.0	....	14	—	79	—	...	....	....
		3.0 in.	Solution Heat Treated and Aged	58.0	42.0	25	—	70	—
ROD	.156 in.	Solution Heat Treated and Aged	56.0	40.0	....	30	—	68	—	...	....	....
		Solution Heat Treated and Cold Worked (91%)	74.0	73.0	....	5	—	—	—	...	....	....
TUBE	.500 in.	Solution Heat Treated, Cold Worked (90%), and Aged	86.0	77.0	....	14	—	—	—	...	....	....
		Solution Heat Treated	45.0	14.0	....	40	—	—	—	...	....	....
		Solution Heat Treated and Aged (500C-3 hrs)	70.0	55.0	....	21	—	70	—	...	....	....
		Solution Heat Treated and Cold Worked (60.5%)	57.0	56.0	....	11	—	65	—	...	....	....
		Solution Heat Treated and Cold Worked (60.5%) and Aged (450C-3 hrs)	77.0	65.0	....	16	—	82	—	...	....	....
		Solution Heat Treated, Cold Worked (50%), Aged and Cold Worked (6%)	77.0	67.0	....	19	—	83	—	...	....	....
		Solution Heat Treated and Aged	72.0	65.0	....	18	—	80	—	...	....	....
		Solution Heat Treated and Aged	70.0	65.0	....	18	—	75	—	...	....	....
		Solution Heat Treated and Aged	65.0	55.0	....	18	—	70	—	...	....	....
		Solution Heat Treated and Aged	65.0	55.0	....	18	—	70	—	...	....	....
TUBE	3/8 in.OD X .094 in. 1.250in.OD X .212 in.	Mill Annealed	40.0	15.0	....	50	59	—	—	...	....	....
		Solution Heat Treated and Cold Worked (76%)	59.0	57.0	....	21	—	67	—	...	....	....
		Solution Heat Treated, Cold Worked (76%), Aged and Cold Worked (28%)	69.0	63.0	....	26	—	84	—	...	....	....

The values listed above represent approximations suitable for general engineering use. Due to commercial variations in composition and to manufacturing limitations, they should not be used for specification purposes. See applicable A.S.T.M. specification references.



Composition—percent

	Nominal	Minimum	Maximum
Copper	99.1	....	....
Iron10
Chromium	9	.6	1.2
Silicon10
Lead05
Arsenic
Calcium
Lithium
Phosphorus
Zinc
Silver
Copper (Incl. Ag) + Elements with Specific Limits	99.5	....

Nearest Applicable A S T M Specifications

Flat Products	F9
Pipe	
Rod	
Shapes	
Tube	
Wire	

Physical Properties

	English Units	C.G.S. Units
Melting Point (Liquidus)	1967 F	1075 C
Melting Point (Solidus)	1958 F	1070 C
Density	.321 lb/cu in @ 68 F	8.89 gm/cu cm @ 20 C
Specific Gravity	8.89	8.89
Coefficient of Thermal Expansion	.0000098 per ° F from 68 F to 212 F	.0000176 per ° C from 20 C to 100 C
Coefficient of Thermal Expansion	per ° F from 68 F to 392 F	per ° C from 20 C to 200 C
Coefficient of Thermal Expansion	per ° F from 68 F to 572 F	per ° C from 20 C to 300 C
Thermal Conductivity**	187 Btu/sq ft/ft/hr/°F @ 68 F	.77 cal/sq cm/cm/sec/° C @ 20 C
Electrical Resistivity (Annealed)**	13.0 Ohms (circ mil/ft) @ 68 F	2.16 Microhm-cm @ 20 C
Electrical Conductivity* (Annealed)**	80 % IACS @ 68 F	.463 Megmho-cm @ 20 C
Thermal Capacity (Specific Heat)	.092 Btu/lb °F @ 68 F	.092 cal/gm/° C @ 20 C
Modulus of Elasticity (Tension)	17,000,000 psi	12,000 Kg/sq mm
Modulus of Rigidity	7,200,000 psi	5,100 Kg/sq mm

*Volume Basis

**Solution Heat Treated, Cold Worked (50% minimum) and Aged (Volume Basis)

Typical Uses

Resistance welding machine electrodes, seam welding wheels, electrical switch gear, electrode holder jaws, cable connectors, current carrying arms and shafts, circuit breaker parts, arcing and bridging parts, grid siderods in electron tubes, molds, spot welding tips, flash welding electrodes, electrical and thermal conductors requiring greater strength than copper, switch contacts

Common Fabrication Processes

Hot: Extrusion, rolling, forging
Cold: Drawing, rolling, impacting, heading, bending, swaging

Fabrication Properties

Capacity for Being Cold WorkedExcellent
Capacity for Being Hot FormedGood
Hot Forgeability Rating (Forging Brass = 100)80
Hot Working Temperature1500-1700 F or 800-925 C
***Annealing Temperature F or C
Machinability Rating (Free Cutting Brass = 100)20

Suitability for being joined by:

SolderingGood
BrazingGood
Oxyacetylene WeldingNot Recommended
Gas Shielded Arc WeldingGood
Coated Metal Arc WeldingNot Recommended
SpotNot Recommended
Resistance Welding SeamNot Recommended
ButtFair

***Recommended Solution Heat Treating and Aging Cycles

Condition	Solution Treating	Time	Aging	Time
Solution Heat Treated and Aged or Solution Heat Treated, Cold Worked and Aged	1800-1850F 980-1000C	10-30 min.	800-930F 425-500C	2-4 hrs.

The values listed above represent reasonable approximations suitable for general engineering use. Due to commercial variations in composition and to manufacturing limitations, they should not be used for specification purposes. See applicable A.S.T.M. specification references.