

Alloy 25 (C17200) Rod and Bar

Alloy 25 rods and bars from Materion provide the highest strength of any copper alloy, with electrical and thermal conductivity considerably greater than other high-strength copper alloys. This alloy features high fatigue strength and resistance to wear, corrosion, galling, and stress relaxation. Typical applications include downhole drilling flex shafts, bushings and bearings, circular and coaxial connectors, test probes, and compression contacts.

Chemical Composition (Weight Percent)

Alloy	Beryllium	Nickel + Cobalt	Nickel + Cobalt + Iron	Copper
C17200	1.80 - 2.00	0.20 min.	0.6 max.	Balance

Typical Physical Properties*

Elastic Modulus	Melting Point (Solidus)	Electrical Conductivity/ Resistivity	Density**	Thermal Expansion Coefficient (20 °C to 200 °C)	Thermal Conductivity (25 °C)
19,000 ksi 131 GPa	1600 °F 870 °C	25 - 30% IACS 5.8 - 6.9 μΩ - cm	0.302 lb/in ³ 8.36 g/cm ³	9.7 x 10 ⁻⁶ in/in °F 17.5 x 10 ⁻⁶ m/m °C	60 BTU/ft hr °F 105 W/m K

*Properties listed for the precipitation age hardened (heat treated) condition.

**Value listed is the density after heat treatment. The density before heat treatment is 0.300 lb/in³ (8.30 g/cm³).

Typical Mechanical Properties*

Temper*	Outer Diameter (Rod) or Thickness (Bar)		Heat Treatment Required at 600 - 675 °F 315 - 357 °C	0.2% Offset Yield Strength		Ultimate Tensile Strength		Elongation percent
	inch	mm		ksi	MPa	ksi	MPa	
A (TB00)	0.030 - 14	0.76 - 356	Before heat treatment	20 - 35	130 - 250	60 - 85	410 - 590	20 - 75
H (TD04)	0.030 - 0.375	0.76 - 9.5		75 - 105	520 - 720	90 - 130	620 - 900	8 - 30
H (TD04)	> 0.375 - 1	> 9.5 - 25.4		75 - 105	520 - 720	90 - 125	620 - 860	8 - 30
H (TD04)	> 1 - 3	> 25.4 - 76		75 - 105	520 - 720	85 - 120	590 - 830	8 - 20
AT (TF00)	0.030 - 3	0.76 - 76	After 3 hours	145 - 175	1000 - 1210	165 - 200	1140 - 1380	4 - 10
AT (TF00)	> 3 - 14	> 76 - 356		130 - 175	900 - 1210	165 - 200	1140 - 1380	3 - 10
HT (TH04)	0.030 - 0.375	0.76 - 9.5	After 2 - 3 hours	160 - 200	1100 - 1380	185 - 225	1280 - 1550	2 - 9
HT (TH04)	> 0.375 - 1	> 9.5 - 25.4		155 - 195	1070 - 1340	180 - 220	1240 - 1520	2 - 9
HT (TH04)	> 1 - 3	> 25.4 - 76		145 - 190	1000 - 1310	175 - 215	1210 - 1480	4 - 9

*Properties may vary by diameter (rod) or thickness (bar).

**Rod and bar typically provided in an annealed or cold drawn temper and heat treated after machining. Only rod or bar greater than 0.4375" (11.11 mm) diameter or thickness may also be purchased in the pre-heat treated condition.

Forms Available

Alloy 25 rod (round cross section) and bar (rectangular cross section) are supplied in straight lengths up to 30 ft (9.1m). Solution annealed tempers are available in diameters/thicknesses ranging from 0.030" to 14" (0.76 mm to 356 mm) and hard drawn tempers are available in 0.030" to 3" (0.76 mm to 76 mm). Alloy 25 is also available in strip, wire, plate, tube, and parts finished by drawing, extrusion, and machining.

Industry Standards and Specifications

UNS# C17200, ASTM B196, AMS 4533, AMS 4534, AMS 4650, AMS 4651, SAE J461, SAE J463, JIS H3270, EN 1654, EN 12163, EN 12165, EN 12167, GB5233, GB4431, BMS 7-353 Type 2, MIL-C-21657

Rod Tolerances

	Rod Diameter (inches)		Standard Diameter Tolerance (in)		Rod Diameter (mm)		Standard Diameter Tolerance (mm)	
	Over	Including	Diameter	Out of Round	Over	Including	Diameter	Out of Round
Cold Drawn	0.0300	0.0800	± 0.0003	0.0003	0.76	2.0	± 0.008	0.008
	0.0800	0.1250	± 0.0004	0.0004	2.0	3.2	± 0.010	0.010
	0.1250	0.2500	± 0.0006	0.0004	3.2	6.4	± 0.015	0.010
	0.2500	0.3125	± 0.0007	0.0007	6.4	7.9	± 0.018	0.018
	0.3125	0.3750	± 0.001	0.001	7.9	9.5	± 0.025	0.025
	0.3750	0.500	± 0.002		9.5	12.0	± 0.05	
	0.500	1.00	± 0.003		12.0	25.0	± 0.08	
	1.00	2.00	± 0.004		25.0	50.0	± 0.10	
	2.00	3.00	± 0.2% of Size		50.0	75.0	± 0.2% of Size	
As Extruded	0.750	1.25	± 0.020		20	30	± 0.50	
	1.25	2.50	± 0.030		30	65	± 0.75	
	2.50	6.00	± 0.060		65	150	± 1.50	

Additional tolerances are per ASTM B249. Please specify the exact tolerances that you require when you place your order. Tighter tolerances may be available at additional cost. Please contact your local sales engineer to confirm the requested capability.

Bar Tolerance - Width

Bar Width	Over .188" - .5" incl. (4.8 - 12 mm)	Over .5" - 1.25" incl. (12 - 30 mm)	Over 1.25" - 2" incl. (30 - 50 mm)	Over 2" - 3" incl. (50 - 76 mm)
Width Tolerance Plus and Minus	.005" (0.13 mm)	.007" (0.18 mm)	.010" (0.25 mm)	.015" (0.38 mm)

Cold Rolled Bar Tolerance – Thickness

		Bar Width			
		Over 0.188" – .5" incl. (4.8 – 12 mm)	Over 0.5" – 1.25" incl. (12 – 30 mm)	Over 1.25" – 2" incl. (30 – 50 mm)	Over 2" – 3" incl. (50 – 76 mm)
Cold Rolled Bar Thickness	Over .188" – .5" incl. (4.8 – 12 mm)	.005" (0.13 mm)	.005" (0.13 mm)	.006" (0.15 mm)	.007" (0.18 mm)
	Over .5" – 1" incl. (12 – 25 mm)	-	.006" (0.15 mm)	.007" (0.18 mm)	.008" (0.20 mm)
	Over 1" – 2" incl. (25 – 50 mm)	-	.006" (0.15 mm)	.007" (0.18 mm)	.009" (0.23 mm)
	Over 2" – 3" incl. (50 – 75 mm)			+/- .5%	

Extruded Bar Tolerance – Thickness

As Extruded Bar Thickness	Over .188" to 1" incl. (4.8 to 25 mm)	Over 1" to 2" incl. (25 to 50 mm)	Over 2" to 3" incl. (50 to 75 mm)
Thickness Tolerance	+/- .020" (0.50 mm)	+/- .030" (0.75 mm)	+/- .050" (1.3 mm)

Additional tolerances are per ASTM B249. Please specify the exact tolerances that you require when you place your order. Tighter tolerances may be available at additional cost. Please contact your local sales engineer to confirm the requested capability.

Related Information

Additional technical or safe handling information on Alloy 25 rod or bar may be obtained by phoning +1.800.375.4205. For pricing and availability, phone +1.800.521.8800 for rod >0.5" (12.7 mm) diameter, +1.800.323.2438 for smaller diameter rod.

Health and Safety

Processing beryllium-containing alloys poses a health risk if safe practices are not followed. Inhalation of airborne beryllium can cause serious lung diseases in some individuals. Occupational safety and health regulatory agencies worldwide have set mandatory limits on occupational respiratory exposures. Read and follow the guidance in the Safety Data Sheet (SDS) before working with this material. The SDS and additional important beryllium health and safety information and guidance can be found at berylliumsafety.com, berylliumsafety.eu and Materion.com. For questions on safe practices for beryllium-containing alloys, contact the Materion Product Stewardship Group at +1.800.862.4118 or by email at Materion-PS@Materion.com.

Disclaimer:

Only the buyer can determine the appropriateness of any processing practice, end-product or application. Materion does not make any warranty regarding its recommendations, the suitability of Materion's product, or its processing suggestions for buyer's end product, application or equipment.

The properties presented on this data sheet are for reference purposes only, intended only to initiate the material selection process. They do not constitute, nor are they intended to constitute, a material specification. Material will be produced to one of the applicable industry standards, if any, listed in the Industry Standards and Specification section.

Actual properties may vary by thickness and/or part number. Please contact your local sales engineer for detailed properties to be used in simulation.

Any properties marked as preliminary are subject to change at any time as the manufacturing process is further refined.