

Alloys 3 (C17510) and 10 (C17500) Rod and Bar

Alloys 3 and 10 rod and bar from Materion provide high electrical and thermal conductivity coupled with moderate strength. Typical applications include dies for casting plunger tips and dies for steel extrusion.

Chemical Composition (Weight Percent)

Alloy	Nickel	Cobalt	Beryllium	Copper
3 (C17510)	1.4 - 2.2	-	0.2 - 0.6	Balance
10 (C17500)	-	2.4 - 2.7	0.4 - 0.7	Balance

Typical Physical Properties*

Alloy	Elastic Modulus	Melting Point (Solidus)	Electrical Conductivity/ Resistivity	Density**	Thermal Expansion Coefficient	Thermal Conductivity (25 °C)
3	20,000 ksi 138 GPa	1900 °F 1040 °C	45 - 60% IACS 2.9 - 3.8 μΩ-cm	0.319 lb/in ³ 8.83 g/cm ³	9.8 x 10 ⁻⁶ in/in °F 17.6 x 10 ⁻⁶ m/m °C	140 BTU/ft hr °F 240 W/m °C
10	20,000 ksi 138 GPa	1850 °F 1010 °C	45 - 60% IACS 2.9 - 3.8 μΩ-cm	0.319 lb/in ³ 8.83 g/cm ³	9.8 x 10 ⁻⁶ in/in °F 17.6 x 10 ⁻⁶ m/m °C	115 BTU/ft hr °F 200 W/m °C

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

**Value listed is the density after heat treatment. The density before heat treatment is 0.316 lb/in³ (8.75 g/cm³) for both alloys.

Typical Mechanical Properties*

Temper**	Outer Diameter (Rod) or Thickness (Bar)		Heat Treatment Required	0.2% Offset Yield Strength		Ultimate Tensile Strength		Elongation
	inch	mm		ksi	MPa	ksi	MPa	
A (TB00)	0.030 - 10	0.76 - 254	Before Heat Treatment	10 - 30	70 - 210	35 - 55	240 - 380	20 - 35
H (TD04)	0.030 - 3	0.76 - 76	Before Heat Treatment	50 - 75	340 - 520	65 - 80	450 - 550	10 - 15
AT (TF00)	0.030 - 10	0.76 - 254	After 3 hours	80 - 100	550 - 690	100 - 130	690 - 900	10 - 25
HT (TH04)	0.030 - 3	0.76 - 76	After 2 - 3 hours	95 - 125	660 - 860	110 - 140	760 - 970	5 - 25

*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" (11.0 mm) diameter or thickness may also be purchased in the pre-heat-treated condition.

Forms Available

Alloys 3 and 10 rod and bar are supplied in straight lengths up to 30 ft (9.1 m). Solution annealed tempers are available in diameters/thicknesses ranging from 0.030" to 10" (0.76 mm to 254 mm) and hard drawn tempers are available in 0.030" to 3" (0.76 mm to 76 mm). Alloys 3 and 10 are also available in tube, wire, plate, and parts finished by drawing, extrusion, and machining. Alloy 3 is also available in strip.

Industry Standards and Specifications

Alloy 3: C17510, ASTM B441, ASTM B249/B249M, SAE J461, SAE J463

Alloy 10: C17500, ASTM B441, ASTM B249/B249M, SAE J461, SAE J463

Tolerances

	Rod Diameter or Bar Thickness (inches)		Standard Diameter Tolerance (in)	Rod Diameter or Bar Thickness (mm)		Standard Diameter
	Over	Including	Diameter or Thickness	Over	Including	Diameter or Thickness
Cold Drawn	0.030	0.50	± 0.002	0.76	12.0	± 0.05
	0.50	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
Hot Worked		1.00	± 0.020	20.0	25.0	± 0.50
	1.00	2.00	± 0.030	25.0	50.0	± 0.75
	2.00	3.00	± 0.050	50.0	75.0	± 1.30
	3.00	6.00	± 0.060	75.0	150	± 1.50

Additional tolerances are per ASTM B249 and ASTM B249M. 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 3 or Alloy 10 rod and/or bar may be obtained by phoning +1.800.375.4205. For pricing and availability, phone +1.800.521.8800.

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 contact us 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 Specifications 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.