Alloy 59 Round Bar (UNS N06059 / W.Nr. 2.4605 / NiCr23Mo16Al) — Technical Data Sheet

Round Bar supplied to ASTM B574 and ASME SB574, whose UNS N06059 window runs from 7.94 to 88.9 mm — that document prints no hardness ceiling for the grade, its Table 2 carries the tolerance band for the finished state, and sections above 88.9 mm move to the ASTM B564 forging route.

Chemical Composition — ASTM B574 limits, UNS N06059

Element	Content
Nickel (Ni)	Balance
Chromium (Cr)	22.0–24.0%
Molybdenum (Mo)	15.0–16.5%
Iron (Fe)	1.5% max.
Aluminum (Al)	0.10–0.40%
Copper (Cu)	0.50% max.
Manganese (Mn)	0.50% max.
Cobalt (Co)	0.30% max.
Silicon (Si)	0.10% max.
Phosphorus (P)	0.015% max.
Sulfur (S)	0.010% max.
Carbon (C)	0.010% max.

Minimum Mechanical Properties (ASTM B574, solution annealed)

Condition and Grade	Tensile Strength, min.	Yield Strength (0.2%), min.	Elongation, min.
Solution Annealed — UNS N06059	≥690 MPa (100 ksi)	≥310 MPa (45 ksi)	45%

Physical Properties (Approx.)

Property	Value
Density	Approx. 8.6 g/cm³
Melting range	Approx. 1310–1360 °C
Modulus of elasticity	Approx. 210 GPa
Thermal conductivity at 20 °C	Approx. 10.4 W/m·K
Electrical resistivity at 20 °C	Approx. 1.26 µΩ·m
Specific heat at 20 °C	Approx. 414 J/kg·K
Thermal expansion, 20–100 °C	Approx. 11.9 µm/m·K
Relative magnetic permeability at 20 °C	1.001 max.
Strengthening route	Cold work only

Standards and Designations

Standard	Product or Application
ASTM B574 / ASME SB574	Nickel-chromium-molybdenum rod and bar, solution annealed
ASTM B564 / ASME SB564	Forgings and forging stock above the bar window
NACE MR0175 / ISO 15156	Sour service, listed at the highest test level

Heat Treatment (solution anneal and release)

Condition	Typical Treatment
Solution Annealed	Held between 1100 °C and 1180 °C and water quenched, with about 1120 °C the preferred figure
Cooling Rate	Better than 150 °C per minute from the anneal down to about 500 °C, or grain-boundary phases form
Hot-Worked	Forged or rolled between 1180 °C and 950 °C, with heavy reduction taken at the top of that band
Cold-Drawn	Drawn after the anneal, in one of the three graded strength levels that Table 3 defines
Cold-Forming Limit	Deformation beyond 15% sends the section back through the final solution anneal before service
Stress-Relief Caution	A relief pass inside the precipitation band still costs corrosion resistance, so the alternative is settled before it is booked
Post-Weld Anneal	Most joints enter service as welded, because the low carbon and silicon levels keep the weld zone stable

Surface Finishes (Round Bar)

Surface Condition	Typical Use
Solution Annealed and Pickled	The anneal followed by acid descaling leaves this round bar scale-free for mixed acid and chloride duty.
Peeled	A machined skin gives this round bar an even diameter ahead of the finishing cut.
Cold Drawn	Drawn stock holds a close diameter on this round bar while the drawing pass lifts proof stress.

Typical Supply Dimensions — Round Bar

Product Form	Typical Supply	Length
Round Bar	7.94–88.9 mm dia., solution annealed to ASTM B574	Cut to length or random
Pickled Round Bar	7.94–19.05 mm dia., clause 1.2.1	Cut to length or random
Ground Round Bar	19.05–88.9 mm dia., clause 1.2.2	Cut to length
Turned Round Bar	19.05–88.9 mm dia., machined skin	Cut to length
Cold-Drawn Round Bar	6.35–88.9 mm dia., clause 1.2.3	Cut to length
Custom Round Bar	To drawing	Custom

ASTM B574 prints three mechanical columns for UNS N06059 and no hardness ceiling, so release rests on chemistry and tensile results. Values are for reference; the mill test certificate prevails for final acceptance.