SOUTHERLY ALLOY

Alloy 20 Bar and Rod | UNS N08020 | Werkstoff Nr. 2.4660 | NiCr20CuMo | NS1403

ASTM B473 / ASME SB473 — Nickel-Iron-Chromium Alloy Bar, Rod, and Wire

Product Description

Alloy 20 bar and rod carries UNS N08020 from 6 to 300 mm diameter under ASTM B473, with heavier sections moving to the forging route. Copper in the matrix carries dilute sulphuric and phosphoric acid duty that defeats 316L, while the high nickel content keeps chloride stress-corrosion cracking away. The grade is stabilised with niobium, so a machined or welded part holds its corrosion resistance without a post-weld anneal. Bar ships stabilised annealed and water quenched between 927 and 1010 °C, and cold drawing lifts yield above the annealed floor.

Chemical Composition

Element	Content (UNS N08020)	Element	Content (UNS N08020)
Nickel (Ni)	32.0–38.0%	Chromium (Cr)	19.0–21.0%
Copper (Cu)	3.0–4.0%	Molybdenum (Mo)	2.0–3.0%
Niobium (Nb + Ta)	8 × C min., 1.00% max.	Manganese (Mn)	2.00% max.
Silicon (Si)	1.00% max.	Carbon (C)	0.07% max.
Phosphorus (P)	0.045% max.	Sulfur (S)	0.035% max.
Iron (Fe)	Balance		

Copper is the deliberate addition behind the acid performance, and the niobium range scales with the carbon content at eight times carbon as a minimum. ASTM B463, B473, and B729 share this one composition table, so a single window governs every product form. The mill certificate governs final acceptance.

Minimum Room-Temperature Mechanical Properties

Standard / Form and Condition	Tensile Strength, min.	Yield Strength (0.2%), min.	Elongation / Hardness, min.
Bar, rod, and wire, ASTM B473 – stabilised annealed	≥ 80 ksi (551 MPa)	≥ 35 ksi (241 MPa)	30%, 217 HB or 95 HRB max.
Forged bar and forging stock, ASTM B462 – stabilised annealed	≥ 80 ksi (551 MPa)	≥ 35 ksi (241 MPa)	30%

ASTM B473 adds a 50% minimum reduction of area to the row above, and a strain-hardened condition carries its own row in the same standard. Wire takes a tensile window of 90 to 120 ksi (620 to 830 MPa) with no yield, elongation, or reduction rule attached. The grade takes no aging treatment.

Physical Properties (typical values)

Property	Value
Density	Approx. 8.08 g/cm³
Melting range	Approx. 1385–1443 °C
Modulus of elasticity	Approx. 193 GPa
Shear modulus	Approx. 76 GPa
Thermal conductivity at 20 °C	Approx. 12.3 W/m·K
Electrical resistivity at 20 °C	Approx. 1.08 µΩ·m
Specific heat at 20 °C	Approx. 500 J/kg·K
Thermal expansion, 25–100 °C	Approx. 14.7 µm/m·°C
Magnetic response	Essentially non-magnetic
Strengthening route	Cold work only

Typical values from the published Special Metals data sheet for the grade, intended for design work rather than acceptance testing. Density is quoted at 8.08 g/cm³, and the melting range follows the same source.

Applicable Standards

Standard / Designation	Scope
ASTM B473 / ASME SB473	Bar, rod, and wire
ASTM B462 / ASME SB462	Forgings and forged bar
ASTM B472	Forging billets and bars for reforging
ASTM B463 / ASME SB463	Plate, sheet, and strip cut from the same heat
NACE MR0175 / ISO 15156-3	Sour service qualification for oil and gas
UNS N08020 · W.Nr. 2.4660 · NiCr20CuMo · GB/T 15007 NS1403	Material designations
SAE AMS	No aerospace specification covers this grade

Alloy 20 is stabilised with niobium, so most welded joints need no post-weld anneal and enter service as welded. Heat treatment differs by form: flat product and tubular product hold at 982–1010 °C, while bar holds at 927–1010 °C, and every route is water quenched or rapidly cooled. Filler metal: ER320LR to AWS A5.14, or E320LR to AWS A5.11.

Typical Supply Dimensions

Product Form	Typical Supply Range
Hot-finished round bar	6–300 mm diameter to ASTM B473
Cold-finished round bar	6–100 mm diameter, closer tolerance by agreement
Square and hexagon bar	8–80 mm across flats
Flat bar	3–150 mm thick, up to 300 mm wide
Wire and rod in coils	1.5–12 mm diameter to ASTM B473
Forged bar and forging stock	Sections above the agreed bar range to ASTM B462 and B472

Heavier sections leave ASTM B473 and ship as forged bar to ASTM B462. Bar holds at 927–1010 °C for the anneal, a wider window than flat product and tube use.

Surface Finishes

Surface Condition	Typical Use
Stabilised annealed and pickled	Standard delivery for acid and chloride service
Hot-worked	As-rolled or as-forged surface for parts that will be machined
Cold drawn	Close diameter control with a brighter surface
Peeled	Uniform diameter with a machined skin for further turning
Centerless ground	Tight diameter and straightness for shafting
Polished	Reduced roughness for product-contact and visible parts
Bright annealed	Scale-free surface for instrument and clean circuits