SOUTHERLY ALLOY

Incoloy 800 / 800H / 800HT Pipe and Tube | UNS N08800 / N08810 / N08811 | Werkstoff Nr. 1.4876 / 1.4958 / 1.4959

ASTM B407 / B163 / B514 / B515 — Seamless and Welded Tubular Product

Product Description

Incoloy 800 series pipe and tube carries cracking and reforming duty where the tube wall sits between a hot process gas and a pressure boundary. ASTM B407 governs seamless pipe and tube, B163 covers heat-exchanger tube with its own fibre stress table, and B514 with B515 covers welded product. Alloy UNS N08800 holds to about 593 °C, and the controlled-carbon grades take over above that line for creep-controlled service. U-bent lengths, coiled tube, and heavy-wall pipe all quote against the same three designations.

Chemical Composition

Element	Alloy 800 (UNS N08800)	Alloy 800H (UNS N08810)	Alloy 800HT (UNS N08811)
Nickel (Ni)	30.0–35.0%	30.0–35.0%	30.0–35.0%
Chromium (Cr)	19.0–23.0%	19.0–23.0%	19.0–23.0%
Iron (Fe)	39.5% min.	39.5% min.	39.5% min.
Carbon (C)	0.10% max.	0.05–0.10%	0.06–0.10%
Aluminium (Al)	0.15–0.60%	0.15–0.60%	0.25–0.60%
Titanium (Ti)	0.15–0.60%	0.15–0.60%	0.25–0.60%
Aluminium + Titanium	0.30–1.20%	0.30–1.20%	0.85–1.20%
Copper (Cu), max.	0.75%	0.75%	0.75%
Manganese (Mn), max.	1.50%	1.50%	1.50%
Silicon (Si), max.	1.00%	1.00%	1.00%
Sulfur (S), max.	0.015%	0.015%	0.015%
Annealed grain size	Not specified	ASTM 5 or coarser	ASTM 5 or coarser

One composition table serves ASTM B407, B408, B409, and B163. Iron is determined arithmetically by difference, and the Al+Ti total applies to alloy UNS N08811 alone.

Minimum Room-Temperature Mechanical Properties

Standard / Form / Grade and Condition	Tensile Strength, min.	Yield Strength (0.2%), min.	Elongation, min.
B407 seamless – N08800 cold-drawn, annealed	≥ 75 ksi (520 MPa)	≥ 30 ksi (205 MPa)	30%
B407 seamless – N08800 hot-finished	≥ 65 ksi (450 MPa)	≥ 25 ksi (170 MPa)	30%
B407 seamless – N08810 / N08811, annealed	≥ 65 ksi (450 MPa)	≥ 25 ksi (170 MPa)	30%
B163 exchanger tube – N08800, annealed	≥ 75 ksi (517 MPa)	≥ 30 ksi (207 MPa)	30%
B163 exchanger tube – N08800, cold-worked	≥ 83 ksi (572 MPa)	≥ 47 ksi (324 MPa)	30%
B163 exchanger tube – N08810 / N08811, annealed	≥ 65 ksi (448 MPa)	≥ 25 ksi (172 MPa)	30%
B514 welded pipe – N08800, as-welded or annealed	≥ 75 ksi (520 MPa)	≥ 30 ksi (205 MPa)	30%
B514 / B515 welded – N08810 / N08811, annealed	≥ 65 ksi (450 MPa)	≥ 25 ksi (170 MPa)	30%

Grain size for annealed N08810 and N08811 runs ASTM No. 5 or coarser, and the laboratory rates it to ASTM E112. Hydrostatic testing follows P = 2St/D, with an allowable fibre stress of 18,700 psi (130 MPa) for cold-drawn annealed N08800 and 16,600 psi (115 MPa) for hot-finished N08800 and for annealed N08810 and N08811.

Physical Properties (typical values)

Property	Value
Density	Approx. 7.94 g/cm³
Melting range	Approx. 1357–1385 °C
Specific heat, 0–100 °C	Approx. 460 J/kg·°C
Modulus of elasticity at 20 °C	Approx. 196.5 GPa
Thermal conductivity at 20 °C	Approx. 11.5 W/m·K
Thermal expansion, 20–100 °C	Approx. 14.4 µm/m·°C
Electrical resistivity at 20 °C	Approx. 0.989 µΩ·m
Curie temperature	Approx. –115 °C
Magnetic behaviour	Non-magnetic at ambient temperature
Hardness, annealed	Approx. 138 HB

Typical values hold for all three designations, because the carbon window does not change the physical base. They support design work rather than acceptance testing.

Applicable Standards

Standard / Designation	Scope
ASTM B407 / ASME SB407 (with B829)	Seamless pipe and tube – UNS N08800, N08810, N08811
ASTM B163 / ASME SB163	Seamless condenser and heat-exchanger tube
ASTM B514 (with B775) · B515 (with B751)	Welded pipe, and welded tube
ASTM B564 / B366	Forgings, and wrought pipe fittings for the same lines
ASME Code Cases 1325 / 1983 / 1987	Elevated-temperature design allowables for 800H and 800HT
ASME Code Cases N-201 / N-253 / N-254	Nuclear Section III construction, including steam-generator tubing
DIN 17751 · ISO 6207	Seamless tube in nickel and nickel alloys
BS 3074 (NA 15 series) · JIS G 4902	British and Japanese seamless tube designations for the series
EN 10095 · VdTÜV 345	European heat-resisting materials standard; wrought nickel delivery conditions

Examination follows the ordered document: hydrostatic testing on every length, with eddies or ultrasonic testing where the specification allows a substitution. Filler metal: ERNiCr-3 to AWS A5.14 for matching composition. Service ceiling: ASTM B407, B408, and B409 all name 1100 °F (593 °C) as the normal limit for UNS N08800, and the controlled-carbon grades take over above that line where resistance to creep and rupture governs. ASME Code Case 1325 carries the 800H Section I allowables, Code Case 1983 extends the Section VIII Division 1 allowables to 1800 °F (982 °C), and Code Case 1987 covers 800HT. Both controlled-carbon grades anneal to ASTM No. 5 or coarser grain, which is what the creep duty rests on.

Typical Supply Dimensions

Product Form	Outside Diameter	Wall Thickness	Length
Seamless pipe	6–219 mm	Wall to 25 mm	Random or cut
Heat-exchanger tube	6–76 mm	Close wall tolerance	Cut to length
Welded pipe	12–2032 mm	1.0–20 mm	Random or cut
Welded tube	12–152 mm	0.8–6.0 mm	Cut to length
U-bent tube	6–76 mm	Per bundle drawing	Per bundle drawing
Coiled tube	6–38 mm	Wall to drawing	Coil or cut length

800H and 800HT tube ships solution annealed at 1121 °C and 1149 °C minimum respectively, so the coarse grain survives the finishing pass.