

# SOUTHERLY ALLOY

Nickel 200 / Nickel 201 | UNS N02200 / N02201 | Werkstoff Nr. 2.4066 / 2.4068

ASTM B160 / B161 / B162 / B163 — Commercially Pure Wrought Nickel, All Product Forms

## Product Description

Nickel 200 and Nickel 201 are commercially pure wrought nickel grades that share one chemistry and differ in carbon alone. The 0.15% limit in UNS N02200 gives way to 0.02% in UNS N02201, which moves the graphitization threshold from roughly 315 °C to about 677 °C. Both grades resist caustic and reducing media, carry heat and current well, and stay workable by cold forming, so they serve chlor-alkali plant, heat-transfer, and electrical duty.

## Chemical Composition

| Element              | Nickel 200 (UNS N02200) | Nickel 201 (UNS N02201) |
|----------------------|-------------------------|-------------------------|
| Nickel (Ni), min.    | 99.0%                   | 99.0%                   |
| Copper (Cu), max.    | 0.25%                   | 0.25%                   |
| Iron (Fe), max.      | 0.40%                   | 0.40%                   |
| Manganese (Mn), max. | 0.35%                   | 0.35%                   |
| Carbon (C), max.     | 0.15%                   | 0.02%                   |
| Silicon (Si), max.   | 0.35%                   | 0.35%                   |
| Sulfur (S), max.     | 0.01%                   | 0.01%                   |

*Nickel is determined by difference and includes cobalt. The same composition table appears in ASTM B160, B161, B162, and B163.*

## Minimum Room-Temperature Mechanical Properties by Product Form

| Grade / Product / Condition                               | Tensile Strength, min. | Yield Strength (0.2%), min. | Elongation, min. |
|-----------------------------------------------------------|------------------------|-----------------------------|------------------|
| B160 bar, grade 200, cold-worked rounds ≤ 25.4 mm (1 in.) | ≥ 80 ksi (550 MPa)     | ≥ 60 ksi (415 MPa)          | 10%              |
| B160 bar, grade 200, hot-worked, all sizes                | ≥ 60 ksi (415 MPa)     | ≥ 15 ksi (105 MPa)          | 35%              |
| B160 bar, grade 200, annealed, all sizes                  | ≥ 55 ksi (380 MPa)     | ≥ 15 ksi (105 MPa)          | 40%              |
| B160 bar, grade 201, annealed, all sizes                  | ≥ 50 ksi (345 MPa)     | ≥ 10 ksi (70 MPa)           | 40%              |
| B161 tube, grade 200, annealed, OD ≤ 127 mm (5 in.)       | ≥ 55 ksi (380 MPa)     | ≥ 15 ksi (105 MPa)          | 35%              |
| B161 tube, grade 200, stress-relieved, all sizes          | ≥ 65 ksi (450 MPa)     | ≥ 40 ksi (275 MPa)          | 15%              |
| B161 tube, grade 201, annealed, OD to 127 mm (5 in.)      | ≥ 50 ksi (345 MPa)     | ≥ 12 ksi (80 MPa)           | 35%              |
| B163 exchanger tube, grade 200, annealed                  | ≥ 55 ksi (380 MPa)     | ≥ 15 ksi (105 MPa)          | 40%              |
| B162 plate, grade 200, annealed                           | ≥ 55 ksi (380 MPa)     | ≥ 15 ksi (100 MPa)          | 40%              |
| B162 sheet and strip, grade 200, annealed                 | ≥ 55 ksi (380 MPa)     | ≥ 15 ksi (100 MPa)          | 40%              |
| B162 plate, grade 201, annealed                           | ≥ 50 ksi (345 MPa)     | ≥ 12 ksi (80 MPa)           | 40%              |
| B162 sheet and strip, grade 200, hard temper              | ≥ 90 ksi (620 MPa)     | ≥ 70 ksi (480 MPa)          | 2%               |

*Elongation requirements do not apply below a 2.4 mm (3/32 in.) section on bar. B162 waives the yield requirement under 0.51 mm (0.020 in.) thickness, and strip below 0.25 mm carries*

*no tensile requirement. The MPa figures follow each standard's own conversion.*

## Physical Properties (typical values)

| Property                      | Nickel 200 (N02200)               | Nickel 201 (N02201)               |
|-------------------------------|-----------------------------------|-----------------------------------|
| Density                       | Approx. 8.89 g/cm <sup>3</sup>    | Approx. 8.89 g/cm <sup>3</sup>    |
| Melting range                 | Approx. 1435–1446 °C              | Approx. 1435–1446 °C              |
| Specific heat, 20 °C          | Approx. 456 J/kg·K                | Approx. 456 J/kg·K                |
| Curie temperature             | Approx. 360 °C (680 °F)           | Approx. 360 °C (680 °F)           |
| Modulus of elasticity         | Approx. 205 GPa                   | Approx. 207 GPa                   |
| Thermal conductivity, 20 °C   | Approx. 70.3 W/m·K                | Approx. 79.3 W/m·K                |
| Electrical resistivity, 20 °C | Approx. 0.096 μΩ·m                | Approx. 0.085 μΩ·m                |
| Thermal expansion, 20–100 °C  | Approx. 13.3 μm/m·K               | Approx. 13.2 μm/m·K               |
| Poisson's ratio               | Approx. 0.29                      | Approx. 0.29                      |
| Magnetic behaviour            | Ferromagnetic at room temperature | Ferromagnetic at room temperature |

*Typical values for annealed material at room temperature, given for design work rather than acceptance testing. The two grades differ most in thermal conductivity and electrical resistivity.*

## Applicable Standards

| Standard / Designation               | Scope                                                                                              |
|--------------------------------------|----------------------------------------------------------------------------------------------------|
| ASTM B160 / B161 / B162 / B163       | Bar, seamless tube, flat-rolled product, exchanger tube — UNS N02200 and N02201                    |
| ASTM B725 / B730                     | Welded pipe and welded heat-exchanger tube                                                         |
| ASTM B564 / B366                     | Forgings and fittings                                                                              |
| SAE AMS 5553                         | Low-carbon sheet and strip 0.03–0.65 mm — grade 201 only; plate excluded, and grade 200 has no AMS |
| DIN 17740 / 17750 / 17751 / 17752    | Composition, flat-rolled, seamless tube, bar and rod (ISO 6208 / 6207 / 9723 equivalent)           |
| BS 3072 / 3073 / 3074 (NA12)         | British flat-rolled and seamless tube standards                                                    |
| VdTÜV 345 · JIS G 4901 / 4902 / 4904 | Wrought nickel; Japanese plate, tube, and bar standards                                            |

*ISO 9724 and DIN 17753 cover wire rather than bar. Nickels for these grades follow the ASTM standard named on the order for acceptance.*

## Typical Supply Dimensions

| Product Form        | Typical Supply Range   | Length                  |
|---------------------|------------------------|-------------------------|
| Bar and rod         | 6–500 mm dia.          | Cut to length or random |
| Seamless pipe       | 6–219 mm outside dia.  | Random or fixed         |
| Heat-exchanger tube | 10–426 mm outside dia. | Fixed                   |
| Plate               | 4.76–50 mm thick       | Up to 6000 mm           |
| Sheet               | 0.5–4.76 mm thick      | Up to 2500 mm           |
| Strip               | 0.13–3.2 mm thick      | Coil                    |

*Service ceiling: ASME Section VIII Division 1 approves Nickel 200 to 600 °F (315 °C) and Nickel 201 to 1250 °F (677 °C). Above 315 °C, carbon leaves solution as graphite along the grain boundaries of grade 200, so continuous hot duty calls for grade 201. Grade 201 is sensitive to sulfide-bearing atmospheres above 315 °C, and wet hydrofluoric acid and oxidizing acids fall outside the envelope for both grades.*

*Southerly Alloy — nickel alloy bar, rod, pipe, tube, plate and fittings · [www.southerly-alloy.com](http://www.southerly-alloy.com) · Values are for reference; the mill test certificate prevails for final acceptance.*

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