# SOUTHERLY ALLOY

## Incoloy 800 / 800H / 800HT Plate and Sheet | UNS N08800 / N08810 / N08811 | Werkstoff Nr. 1.4876 / 1.4958 / 1.4959

ASTM B409 / ASME SB409 (with B906) — Rolled Plate, Sheet, and Strip

### Product Description

Incoloy 800 series plate, sheet, and strip serves vessel shells, tube sheets, furnace internals, and duct linings. ASTM B409 covers the three designations in rolled form, and B906 supplies the general requirements. Plate offers the only as-rolled temper in the series, and grade 800 sheet and strip carries a drawing and spinning quality table of its own. 800H and 800HT flat product begins at 2.92 mm, where the coarse-grain anneal takes hold.

### 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 (ASTM B409)

| Standard / Form / Grade and Condition | Tensile Strength, min. | Yield Strength (0.2%), min. | Elongation, min. |
|---|---|---|---|
| Hot-rolled plate – N08800, annealed | ≥ 75 ksi (520 MPa) | ≥ 30 ksi (205 MPa) | 30% |
| Hot-rolled plate – N08800, as-rolled | ≥ 80 ksi (550 MPa) | ≥ 35 ksi (240 MPa) | 25% |
| Hot-rolled plate – N08810 / N08811, annealed | ≥ 65 ksi (450 MPa) | ≥ 25 ksi (170 MPa) | 30% |
| Hot-rolled sheet – N08800, annealed | ≥ 75 ksi (520 MPa) | ≥ 30 ksi (205 MPa) | 30% |
| Hot-rolled sheet – N08810 / N08811, annealed | ≥ 65 ksi (450 MPa) | ≥ 25 ksi (170 MPa) | 30% |
| Cold-rolled sheet – N08800, annealed | ≥ 75 ksi (520 MPa) | ≥ 30 ksi (205 MPa) | 30% |
| Cold-rolled sheet – N08810 / N08811, annealed | ≥ 65 ksi (450 MPa) | ≥ 25 ksi (170 MPa) | 30% |
| Cold-rolled strip – N08800, annealed | ≥ 75 ksi (520 MPa) | ≥ 30 ksi (205 MPa) | 30% |
| Cold-rolled strip – N08810 / N08811, annealed | ≥ 65 ksi (450 MPa) | ≥ 25 ksi (170 MPa) | 30% |

*The yield requirement does not apply below 0.020 in. (0.51 mm). UNS N08810 and N08811 sheet and strip are available only at 0.115 in. (2.92 mm) and heavier, and the strip elongation minimum falls away below 0.010 in. (0.25 mm). As-rolled plate may take a stress relief after final rolling, and plate ordered as suitable for hot forming carries no tensile or hardness requirement.*

### Deep-Drawing and Spinning Quality (grade 800, ASTM B409 Table 3)

| Thickness | Max. Grain Section | ASTM Grain Size | Rockwell B, max. |
|---|---|---|---|
| Sheet, 0.050 in. (1.3 mm) and less | 0.0030 in. (0.075 mm) | 4.5 | 86 |
| Sheet, over 1.3 to 6.4 mm | 0.0043 in. (0.110 mm) | 3.5 | 86 |
| Strip, 0.13 to 0.25 mm | 0.0009 in. (0.022 mm) | 8 | 88 |
| Strip, over 0.25 to 3.2 mm | 0.0030 in. (0.075 mm) | 4.5 | 86 |

*The Table 2 mechanical properties do not apply to drawing and spinning quality sheet and strip, and that clause reaches grade 800 alone. The grain size column follows an ASTM E112 rating. Sheet covers product to 56 in. (1.42 m) wide, and strip to 12 in. (305 mm) wide.*

### 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 B409 / ASME SB409 (with B906) | Rolled plate, sheet, and strip – UNS N08800, N08810, N08811 |
| ASTM B906 | General requirements: tolerances, sampling, and test methods |
| SAE AMS 5871 | Alloy 800 sheet, strip, and plate, solution heat treated – UNS N08800 in 0.25–50.8 mm |
| ASTM B408 / B407 / B564 | Rod and bar, seamless pipe and tube, and forgings for the vessel package |
| ASME Code Cases 1325 / 1983 / 1987 | Elevated-temperature design allowables for 800H and 800HT |
| ASME Section VIII Divisions 1 and 2 | Design codes that carry the plate allowables into vessel calculations |
| DIN 17459 · EN 10095 · ISO 6208 | Flat-rolled product in nickel and nickel alloys |
| BS 3072 / 3073 (NA 15 series) · JIS G 4902 | British flat-rolled standards, and Japanese plate and sheet designations |

*Alloy 800H takes a final anneal at 2050 °F (1121 °C) minimum, and 800HT at 2100 °F (1149 °C) minimum. Service ceiling: 1100 °F (593 °C) is the normal limit for UNS N08800, and above that line ASME Code Cases 1325, 1983, and 1987 carry the elevated-temperature allowables for the controlled-carbon grades.*

### Typical Supply Dimensions

| Product Form | Thickness | Width | Length |
|---|---|---|---|
| Hot-rolled plate | 3–100 mm | Up to 2000 mm | Up to 6000 mm |
| Hot-rolled sheet | 1.5–3.5 mm | Up to 1420 mm | Cut to length |
| Cold-rolled sheet | 0.5–3.0 mm | Up to 1420 mm | Cut to length |
| Cold-rolled strip | 0.13–3.2 mm | Up to 305 mm | Coil |
| 800H / 800HT sheet and strip | 2.92 mm and heavier | Per standard range | Coil or cut |
| Plate cut to size | 3–100 mm | Per blank drawing | Per blank drawing |
| Circular blanks | 3–100 mm | 100–2000 mm dia. | Per blank drawing |

*Cut-to-size and profiled plate carries the heat number on every piece, and sheared or plasma-cut edges arrive prepared for the next fabrication step.*