

Product Description

Alloy 59 plate and sheet carries UNS N06059 as flat product to ASTM B575, from 4.76 to 63.5 mm plate down through light sheet and strip. Flat product lines reactor shells, absorber walls, ducting, and storage tanks in mixed acid duty. The low iron content keeps the passive film steady in contaminated acids, and the pitting resistance equivalent near 75 carries the chloride margin. Plate and sheet ship solution annealed and pickled, and a welded shell is best planned around a water quench where the duty is severe.

Chemical Composition

Element	Content (UNS N06059)	Element	Content (UNS N06059)
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.	Carbon (C)	0.010% max.
Phosphorus (P)	0.015% max.	Sulfur (S)	0.010% max.

Iron at 1.5% maximum and silicon at 0.10% maximum are the deliberate restraints behind the grade, and aluminium is the small deliberate addition. ASTM B574, B575, and B564 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.
Plate, sheet, and strip, ASTM B575 – solution annealed	≥ 100 ksi (690 MPa)	≥ 45 ksi (310 MPa)	45%, 100 HRB max.

One annealed condition covers every flat form, so a single row carries this page. Thickness and width together fix the product name under ASTM B906: plate starts at 4.76 mm thick and runs wider than 250 mm, while sheet and strip sit under that thickness.

Physical Properties (typical values)

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-°C
Relative magnetic permeability at 20 °C	1.001 max.
Strengthening route	Cold work only

Typical values published for the grade, intended for design work rather than acceptance testing. The alloy stays essentially non-magnetic, which suits instrument assemblies in acid duty. Cold work is the only route above the annealed floor.

Applicable Standards

Standard / Designation	Scope
ASTM B575 / ASME SB575	Plate, sheet, and strip in the solution-annealed condition
ASTM B906	Permissible variations for flat product, and the form definitions
ASTM B574 / B622 / B619 / B626	Bar and rod, seamless tube, welded pipe, and welded tube in the same grade
ASTM B564 / B366	Forgings and forging stock; factory-made wrought fittings
NACE MR0175 / ISO 15156-3	Sour service qualification for oil and gas
DIN 17750	Flat product in the European system
VdTÜV 505	German pressure-equipment approval
UNS N06059 · W.Nr. 2.4605 · NiCr23Mo16Al · GB/T 15007	Material designations
NS3311	
SAE AMS	No aerospace specification covers this grade

Alloy 59 has no aging response, so cold work sets every figure above the annealed floor, and welded joints usually enter service as welded. Solution annealing sits at 1100–1180 °C followed by a water quench, because the low silicon content makes secondary phases form quickly on a slow cool. Filler metal: ERNiCrMo-13 to AWS A5.14, or ENiCrMo-13 to AWS A5.11.

Typical Supply Dimensions

Product Form	Thickness	Width
Hot-rolled plate	4.76–63.5 mm	Over 250 mm
Cold-rolled plate	4.76–9.52 mm	Over 250 mm
Sheet	Under 4.76 mm	600 mm and over
Strip and coil	Under 4.76 mm	Under 600 mm
Cut blank or circle	To drawing	To drawing

Thickness and width together fix the product name, so an order has to state both. Coil delivery is a packaging choice and does not change the defined form.

Surface Finishes

Surface Condition	Typical Use
Solution annealed and pickled	Standard delivery for vessel and ducting work
Bright annealed	Scale-free face for clean and instrument duty
Polished	Reduced roughness for product-contact interiors
Hot-rolled, descaled	Plate for parts that will be machined or rolled
Cold-rolled	Smooth sheet for lining and forming
Edge prepared	Sheared, plasma cut, or beveled edges to drawing

Southerly Alloy — nickel alloy bar, rod, pipe, tube, plate and fittings · www.southerly-alloy.com · Values are for reference; the mill test certificate prevails for final acceptance.