

# Nickel 200

UNS N02200

Commercially wrought **Nickel 200 ( UNS N02200)** , a grade of pure nickel contains 99.0% nickel, has excellent mechanical properties, magnetic properties, high thermal, electrical conductivity and excellent resistance to many corrosive environment.

## Specification

ASTM B 160 (rod and bar), B 161 (seamless pipe and tube), B 162 (plate, sheet, and strip), B 163 (condenser and heat exchanger tube), B 366 (welding fittings), B 564 (forgings), B 725 (welded pipe), B 730 (welded tube), B 751 (welded tube, general requirements), B 775 (welded pipe, general requirements), B 829 (seamless pipe and tube, general requirements)

## Chemical Composition

Composition limits. 99.0 min Ni + Co; 0.15 max C; 0.25 max Cu; 0.40 max Fe; 0.35 max Mn; 0.35 max Si; 0.01 max S

## Applications

*Typical uses:* Chemical and food processing, electronic parts, aerospace equipment  
*Precaution in use:* Should not be used at service temperatures above 315 °C (600 °F)

## Mechanical Properties

Tensile Properties of Nickel 200:

Form and condition	Tensile strength		Yield strength (0.2 offset)		Elongation, %
	MPa	ksi	MPa	ksi	
<b>Rod and bar</b>					
Hot finished	414–586	60–85	103–310	15–45	55–35
Cold drawn	448–758	65–110	276–690	40–100	35–10
Annealed	379–517	55–75	103–207	15–30	55–40
<b>Plate</b>					
Hot rolled	379–690	55–100	138–552	20–80	55–35
Annealed	379–552	55–80	103–276	15–40	60–40
<b>Sheet</b>					
Hard	621–793	90–115	483–724	70–105	15–2
Annealed	379–517	55–75	103–207	15–30	55–40
<b>Strip</b>					
Spring temper	621–896	90–130	483–793	70–115	15–2
Annealed	379–517	55–75	103–207	15–30	55–40
<b>Tubing</b>					
Stress relieved	448–758	65–110	276–621	40–90	35–15
Annealed	379–517	55–75	83–207	12–30	60–40
<b>Wire</b>					
Annealed	379–586	55–85	103–345	15–50	50–30
Spring temper	862–1000	125–145	724–931	105–135	15–2

# Nickel 200

UNS N02200

Typical tensile properties of annealed Nickel 200 as a function of temperature:

Temperature		Tensile strength		Yield strength (0.2 offset)		Elongation
°C	°F	MPa	ksi	MPa	ksi	%
20	68	462	67.0	148	21.5	47.0
93	200	458	66.5	154	22.3	46.0
149	300	460	66.7	150	21.7	44.5
204	400	458	66.5	139	20.2	44.0
260	500	465	67.5	135	19.6	45.0
316	600	456	66.2	139	20.2	47.0
371	700	362	52.5	117	17.0	61.5

Typical fatigue strength of Nickel 200:

Cycles	Fatigue strength			
	Cold drawn rod		Annealed rod	
	MPa	ksi	Mpa	ksi
104	751	109	...	...
105	579	84	358	52
106	434	63	276	40
107	358	52	234	34
108	345	50	228	33

## Physical Properties

*Density:* 8.89 g/cm<sup>3</sup> (0.321 lb/in.<sup>3</sup>) at 20 °C (68 °F)

*Liquidus temperature:* 1466 °C (2635 °F)

*Solidus temperature:* 1435 °C (2615 °F)

*Specific heat:* 456 J/ J/kg· K (0.106 Btu/lb · °F) at 21 °C (70 °F)

*Electrical conductivity:* Volumetric, 18.2% IACS at 21 °C (70 °F)

*Curie temperature:* 360 °C (680 °F)

Thermal and electrical properties of annealed Nickel 200

Temperature		Mean linear expansion(a)		Thermal conductivity		Electrical
°C	°F	µm/m · K	µin./in. · °F	W/m · K	Btu/ft · h · °F	resistivity, nΩm
-253	-423	8.5	4.7	...	...	...
-184	-300	10.4	5.8	...	...	27
-200	-129	11.2	6.2	77.2	44.6	43
-100	-73	11.3	6.3	...	...	58
-18	0	...	...	72.1	41.7	80
21	70	...	...	...	...	95
93	200	13.3	7.4	67.1	38.8	126
204	400	13.9	7.7	61.3	35.4	188
316	600	14.4	8.0	56.3	36.5	273

# Nickel 200

UNS N02200

## Chemical Properties

*General corrosion behavior:* Nickel 200 is highly resistant to many corrosive media. Although most useful in reducing environments, it can be used also under oxidizing conditions that cause the formation of a passive oxide film. The alloy has excellent resistance to caustics, high-temperature halogens and hydrogen halides, and salts other than oxidizing halides. It is also well suited to food processing, in which product purity must be maintained. Nickel 201 (low-carbon nickel) should be used for applications involving temperatures above 315 °C (600 °F).

*Resistance to specific corroding agents:* An outstanding characteristic of Nickel 200 is its resistance to caustic soda and other alkalies except ammonium hydroxide. Following table gives corrosion rates in caustic soda.

### Corrosion of Nickel 200 in caustic soda solutions

Environment	Temperature		Corrosion rate	
	°C	°F	µm/yr	mils/yr
Laboratory tests in 4% solution	20	68		
Quiet immersion			1	0.05
Air-agitated immersion			1	0.05
Continuous alternate immersion			13	0.50
Intermittent alternate immersion			15	0.60
Spray test			1	0.05
Plant tests in 14% solution in first effect of multiple-effect evaporator	88	190	0.5	0.02
Plant tests in 23% solution in tank receiving liquor from evaporator	104	220	4.1	0.16
Plant tests in single-effect evaporator concentrating solution from 30–50%	82	179	2.5	0.10
Plant tests in evaporator concentrating to 50% solution			3	0.1
Laboratory tests during concentration from 32–52% (vacuum, 640–685mmHg)	85-91	185-196	33	1.3
Tests in storage tank containing 49–51% solution	55-75	131-167	0.5	0.02
	121	250	25	1.0
Laboratory tests in 75% solution	204	400	20	0.8
Plant tests in 70% electrolytic solution in receiving tank	90-115	194-239	3	0.1