

# 1.3964, X2CrNiMnMoNNb21-16-5-3, S20910, XM-19

Discover the properties of [XM-19](#) ([1.3964](#), [X2CrNiMnMoNNb21-16-5-3](#), [S20910](#)) stainless steel, including chemical composition, mechanical performance, welding, and global equivalents.

## Applications

- Aerospace components
- Chemical processing equipment
- Marine fasteners & valves
- Nuclear reactor parts
- High-strength structural applications

## Equivalent or Similar Grades - Chemical Composition

Element (%)	XM-19 (S20910)	X2CrNiMnMoNNb21-16-5-3 (EN)	1.3964 (DIN)
Carbon (C)	≤0.06	≤0.06	≤0.06
Chromium (Cr)	20.5-23.5	20.5-23.5	20.5-23.5
Nickel (Ni)	11.5-13.5	11.5-13.5	11.5-13.5
Manganese (Mn)	4.0-6.0	4.0-6.0	4.0-6.0
Molybdenum (Mo)	1.5-3.0	1.5-3.0	1.5-3.0
Nitrogen (N)	0.20-0.40	0.20-0.40	0.20-0.40
Niobium (Nb)	0.10-0.30	0.10-0.30	0.10-0.30
Silicon (Si)	≤1.0	≤1.0	≤1.0
Phosphorus (P)	≤0.045	≤0.045	≤0.045
Sulfur (S)	≤0.030	≤0.030	≤0.030

## Mechanical Properties

Property	XM-19 (S20910)	X2CrNiMnMoNNb21-16-5-3	1.3964
Tensile Strength (MPa)	690-895	690-895	690-895
Yield Strength (0.2% Offset, MPa)	≥415	≥415	≥415
Elongation (% in 50mm)	≥30	≥30	≥30
Hardness (Rockwell B)	≤100 HRB	≤100 HRB	≤100 HRB

## High-Temperature & Creep Performance

- **Oxidation Resistance:** Good up to 925°C (1697°F).
- **Creep Strength:** Superior to standard 300-series stainless steels due to nitrogen strengthening.

## Physical Properties

Property	Value
Density (g/cm <sup>3</sup> )	7.9
Melting Range (°C)	1400-1450
Thermal Conductivity (W/m·K at 20°C)	15
Electrical Resistivity (Ω·m)	0.85 × 10 <sup>-6</sup>
Magnetic Permeability	Non-magnetic (annealed)

## Heat Treatment

- **Solution Annealing:** 1050-1150°C (1922-2102°F), followed by rapid cooling (water or air).
- **Stress Relieving:** Not typically required but can be done at 400-600°C (752-1112°F).

## Processing Performance

### Fabrication & Welding

- **Machinability:** Similar to 304/316 but harder; use carbide tools.
- **Welding:** Excellent weldability via TIG, MIG, or SAW. No preheating required.