

# Alloy 625

UNS N06625 / ASTM B446 / AMS5666 / BS3076 NA21  
Stocked in the hot or cold worked and annealed condition



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Alloy 625 is a nickel-chromium-molybdenum alloy with additions of iron, niobium and tantalum that enhance its mechanical properties and corrosion resistance. The alloy is solid solution strengthened alloy and retains a high proportion of its mechanical strength through a wide range of temperatures, from cryogenic values up to elevated temperatures. It also offers an excellent corrosion resistance in a wide variety of media and is utilised in chemical process industries, power generation, offshore sour oil and gas production, waste incineration, phosphoric acid production, nuclear fuel processing, high temperature environments and aerospace.



The annealed condition, as stocked by Columbia Metals, offers the best combination of corrosion resistance, hardness, fatigue, yield and tensile strengths at elevated temperatures up to 815°C. It also has a good resistance to oxidation and scaling up to 980°C under cyclic heating conditions. For long term thermal exposure the use of Alloy 625 is best restricted to a maximum temperature of 595°C .

**CERTIFIED TO  
NACE MR0175 / ISO15156-3**

**COMPLIANT WITH NORSOK M630  
MDS N01 rev.4 FROM A NORSOK M650  
QUALIFIED MANUFACTURER**

**AVAILABLE FROM A DOUBLE MELT ROUTE  
(VIM+ESR) IF REQUIRED**

**ULTRASONICALLY TESTED AND  
WITH IMPACT PROPERTIES  
CERTIFIED AT -110°C**

Alloy 625 has proven to have excellent properties for resisting both corrosion erosion and corrosion fatigue in a wide variety of media including freshwater, seawater, neutral salts and alkalis. It offers high resistance to oxidising chemicals and non-oxidising environments including organic and mineral acids and high temperature sulphides and chlorides. The alloy offers an excellent resistance to pitting and crevice corrosion, attributed to its high molybdenum content, and freedom from chloride stress corrosion cracking mainly due to the nickel content.

Alloy 625 offers good hot and cold formability. The high strength of the material requires powerful equipment and for the alloy to be annealed prior to forming. Alloy 625 naturally retains mechanical properties at elevated temperatures, making hot forming challenging, but heating to a temperature of around 1175°C should enable heavy forging.

The machining characteristics of Alloy 625 are classed as moderate, but in the annealed condition this grade can be machined successfully using conventional methods and proper precaution. The main issues arise from a rapid work hardening and the generation of high heat during cutting. Therefore, the machine, work piece and tool should be rigid with minimal tool overhang. Carbide tipped tools are recommended for most applications and tooling should remain sharp at all times. A positive rake angle should be used for most machining operations, with negative rake angle tools being considered only for intermittent cuts and heavy stock removal. Heavy constant feeds should be used to maintain a positive cutting action combined with high lubrication. Alloy 625 is readily weldable using conventional processes and a matching filler metal.

The high strength and versatile corrosion resistance, even at elevated temperatures, enable Alloy 625 to be used for components such as flanges, exhaust systems, fuel and hydraulic tubing, spray bars, bellows, turbine shroud rings, heat exchanger tubing, bubble caps, reaction vessels, valve and valve trim, pumps, marine propeller blades, submarine transducer controls, flare stacks, fasteners, springs, seals and nuclear control rod components.

**PLEASE CONTACT US FOR AN IMMEDIATE QUOTATION OR TECHNICAL ADVICE**

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# Alloy 625

## Technical Data



### Nominal Composition (%)

Ni	Cr	Mo	Nb	Fe	Ti	Al
58	22	9	3.5	2	0.2	0.2

### Mechanical Properties (specification minima)

	Cold worked annealed <100mm dia
Ultimate Tensile Strength (N/mm <sup>2</sup> )	830
0.2% Proof Strength (N/mm <sup>2</sup> )	415
Elongation (%)	30

### Typical Physical Properties

	Annealed
Density (g/cm <sup>3</sup> )	8.44
Melting Range (°C)	1290 - 1350
Young's Modulus (GPa)	207
Thermal conductivity (20°C; W/m°K)	9.8
Coeff. Thermal Exp. (20-100°C; m/m°K x 10 <sup>-6</sup> )	12.8
Electrical Resistivity (microhm/cm)	132
Magnetic Permeability	<1.001

### Round Bar Weight and Stock Sizes

Diameter ins	Weight		Diameter ins	Weight		Diameter ins	Weight	
	kg/ft	kg/m		kg/ft	kg/m		kg/ft	kg/m
1/4"	0.08	0.27	1.1/8"	1.65	5.41	2.1/4"	6.60	21.66
3/8"	0.18	0.60	1.1/4"	2.04	6.68	2.1/2"	8.15	26.74
1/2"	0.33	1.07	1.3/8"	2.47	8.09	2.3/4"	9.86	32.35
5/8"	0.51	1.67	1.1/2"	2.93	9.63	3"	11.74	38.50
3/4"	0.73	2.41	1.5/8"	3.44	11.30	3.1/4"	13.77	45.18
7/8"	1.00	3.28	1.3/4"	3.99	13.10	3.1/2"	15.97	52.40
1"	1.30	4.28	2"	5.22	17.11	4"	20.86	68.45

NB Weight data for guidance only