

<b>Designation</b>	<b>NiCr22Mo9Nb</b>	EN 2.4856	UNS (ASTM) N06625	AISI -	LMSA B585
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## Chemical composition

Ni (+Co)	Cr	Mo	C	Fe	Ti	Si	Mn
58.0 min.	20.0 - 23.0	8.0 - 10.0	0.10 max.	5.00 max.	0.40 max.	0.50 max.	0.50 max.
Cu	Al	S	P	Nb + Ta	-	-	-
0.50 max.	0.40 max.	0.015 max.	0.015 max.	3.15 - 4.15	-	-	-

Values (Weight %). In order to achieve maximum homogeneity and consistent quality, the actual manufacturing tolerances are tighter and more precisely than the composition indicated.

## Main technical properties and features

Inconel alloy 625 is a commercial Nickel-based superalloy containing chromium, molybdenum and niobium showing excellent corrosion resistance to a variety of corrosive media and high strength from cryogenic temperatures up to 950 °C. Alloy 625 presents two optimum heat treatments, first for service temperature up to 600 °C and the second treatment for service temperatures above 600 °C. For service temperatures at 600 °C and below hot finished, cold-finished and annealed conditions are recommended. For service temperatures above 600 °C, solution-treated conditions are recommended for components that require optimum resistance to creep or rupture.

Inconel Alloy 625 has the same formability capability as standard austenitic stainless steels. However, the material is more resistant than conventional stainless steel, thus higher loads are required to cause the material to deform. The alloy presents a very good cold working capabilities, and it has higher work hardening rate than austenitic stainless steel.

Inconel alloy 625 is resistant to a variety of corrosive media from high oxidizing to moderate reducing. In mild environments such as atmosphere, fresh water and sea water, neutral salts and alkaline media there is almost no attack. In more severe corrosive environments, the combination of nickel and chromium provides resistance to oxidizing chemicals, in which the high nickel and molybdenum contents supply resistance to nonoxidizing environments. The high molybdenum content also makes alloy 625 to have a very good resistance to pitting and crevice corrosion. Moreover, the presence of niobium acts to stabilize the alloy against sensitization during welding, preventing subsequent intergranular cracking. Tests in simulated flue gas desulfurization environments show that Inconel Alloy 625 has a comparable behaviour as Alloy C276. Alloy 625 has an excellent oxidation and scaling resistance at temperatures up to (1093 °C).

Inconel 625 shows higher weldability than mainly high alloyed nickel-based alloys, it can be joined by conventional welding process and procedure, the same processes used for austenitic stainless steel, including fusion and resistance methods.

Despite, Alloy 625 was originally designed as a solid-solution strengthened and corrosion resistant, the alloy is also susceptible to precipitation hardening by the formation of a body-centered tetragonal precipitates  $\gamma''$  ( $D0_{22}$ -Ni<sub>3</sub>Nb) after thermal aging between 550 °C and 750 °C, however aging times are too long.

## Typical uses

Alloy 625 can be used for aerospace components such as expansion joints, jet engine exhaust systems. Air pollution such as flue gas desulfurization, recuperators and compensators for hot exhaust gases. In the offshore industry and seawater exposed equipment.

### Typical manufacturing range

	Thickness (mm)	Width (mm)	Length (mm)
<b>Rolled products</b> Strip in coils <sup>[1]</sup>	0.015 - 0.800	1.5 - 200.0	-
Strip as sheets <sup>[1]</sup>	0.015 - 0.800	10.0 - 200.0	100 - 3000

<sup>[1]</sup> Not all our production possibilities are presented here. Other dimensions or product forms available upon request. Some combinations of thicknesses and widths are not possible.

### Mechanical properties of strips

Temper	R <sub>m</sub> (N/mm <sup>2</sup> )	R <sub>p0.2</sub> (N/mm <sup>2</sup> )	A <sub>50mm</sub> (%)	Hardness HV
annealed	820 - 1050	410 min.	25 min.	190 - 260
¼ hard	1050 - 1300	700 - 1250	5 min.	260 - 420
½ hard	1300 - 1700	1100 - 1650	1 min.	410 - 520
hard	1650 min.	1500 min.	-	480 min.

### Physical properties

Modulus of elasticity	kN/mm <sup>2</sup>	209
Poisson ratio		0.308
Density	g/cm <sup>3</sup>	8.44
Melting point / Melting range	°C	1290 - 1350
Curie temperature	°C	-196
Linear dilatation coefficient at 100 °C	10 <sup>-6</sup> /°C	12.8
Thermal conductivity at 20 °C	W/m °K	9.8
Specific heat at 20 °C	J/(kg. K)	410
Electrical resistivity at 20 °C	μΩcm	128.9
Permeability at 200 Oersted at 20 °C		1.006

### Heat treatment

According to service temperature and properties wanted, Alloy 625 can be subjected to different heat treatments.

Service temperature	Soft annealed condition	Solution annealed condition <sup>[1]</sup>	Optimal properties
Below 600 °C	950 - 1050 °C	-	- excellent corrosion resistance in chloride media - high resistance to corrosion erosion - high resistance to mineral acids such as nitric phosphoric, sulfuric and hydrochloric acid.
Above 600 °C	-	1080 - 1160 °C	- optimized creep strength about 600 °C - resistance to nitriding - resistant to hot gas corrosion.

<sup>[1]</sup> Water quenching or air nozzles (for thin material) should be carried out to achieve optimum corrosion resistance

## Tolerances (strip and foil)

Thickness	Thickness (mm)		Lamineries MATTHEY			
	≥	<	LMSA Standard	LMSA Precision	LMSA Extreme	
<p>The table shown is an outline of our typical thickness tolerances available. They are tighter than industry standards.</p> <p>Our "LMSA Precision" and "LMSA Extreme" tolerances are available upon request.</p>	-	0.025	-	-	± 0.001	
	0.025	0.050	± 0.003	± 0.002	± 0.0015	
	0.050	0.065	± 0.004	± 0.003	± 0.002	
	0.065	0.100	± 0.006	± 0.004	± 0.003	
	0.100	0.125	± 0.008	± 0.006	± 0.003	
	0.125	0.150	± 0.008	± 0.006	± 0.004	
	0.150	0.250	± 0.010	± 0.008	± 0.004	
	0.250	0.300	± 0.012	± 0.008	± 0.005	
	0.300	0.400	± 0.012	± 0.009	± 0.005	
	0.400	0.500	± 0.015	± 0.010	± 0.006	
	0.500	0.600	± 0.020	± 0.012	± 0.007	
	0.600	0.800	± 0.020	± 0.014	± 0.007	
	0.800	1.000	± 0.025	± 0.015	± 0.009	
	1.000	1.200	± 0.025	± 0.018	± 0.012	
	1.200	1.250	± 0.030	± 0.020	± 0.012	
1.250	1.500	± 0.035	± 0.025	± 0.014		
<b>Width</b>	Our width tolerances "Standard" is +0.2, -0.0 (or ± 0.1 mm upon request). They are available for slit widths < 125 mm and thicknesses < 1.00 mm. Special tolerances upon request.					
<b>Camber</b>	Width (mm)		Camber max. (mm/m)			
	>	≤	LMSA standard		LMSA extreme	
			≤ 0.5 mm	> 0.5 mm	≤ 0.5 mm	> 0.5 mm
	3	6	12	-	6	-
	6	10	8	10	4	5
10	20	4	6	2	3	
20	250	2	3	1	1.5	
<b>Surface</b>	Special surface qualities upon request					
<b>Flatness</b>	Special requirement on the longitudinal or transversal flatness upon request					

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