

Designation	NiCu30Fe	EN 2.4360	UNS (ASTM) N04400	AISI -	LMSA B560
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Chemical composition

Ni (+Co)	Cu	Fe	C	Mn	Si	Al	Ti	S
63.0 min.	28.0 - 34.0	1.0 - 2.5	0.15 max.	2.0 max.	0.50 max.	0.50 max.	0.30 max.	0.02 max.

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

Monel 400 alloy is a single-phase nickel-copper solid solution (approx. 67% nickel - 23% copper) with a face-centered cubic metallurgical structure. This alloy can only be hardened by cold working. In the annealed temper, alloy 400 can be easily formed without the need for additional heat treatments, soft annealing can be carried out at temperatures between 700 - 900°C. Alloy 400 has high strength and high toughness from sub-zero temperatures up to 400°C. This alloy does not present a brittle-ductile transition, then it is suitable for many applications where ferrous materials cannot be used.

Alloy 400 has excellent resistance to stress corrosion cracking and is one of the few materials resistant to fluorine, hydrofluoric acid, hydrogen fluoride or their compounds. Alloy 400 has very good resistance to many forms of sulfuric and chloride acids under reducing conditions, it is also highly resistant to corrosion in seawater and alkaline environments. The absence of chromium in its composition makes this alloy vulnerable to oxidizing environments. Alloy 400 may be susceptible to stress cracking in the presence of mercury and aerated hydrochloric acid vapors. Under these conditions, stress-relief annealing at 500 - 650 °C is required. Alloy 400 can be welded using conventional processes such as TIG, plasma and MIG/MAG.

Typical uses

Pumps and drive shafts, chemical processing equipment, heat exchangers, refining plants for crude oil and nuclear fuel production.

Typical manufacturing range

		Thickness (mm)	Width (mm)	Length (mm)
Rolled products	Strip in coils ^[1]	0.015 - 0.500	1.5 - 200.0	-
	Strip as sheets ^[1]	0.015 - 0.500	10.0 - 200.0	100 - 3000

^[1] 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 _m (N/mm ²)	R _{p0.2} (N/mm ²)	A _{50mm} (%)	Hardness HV
soft	480 - 610	170 - 330	25 - 55	120 - 190
½ hard	620 - 780	500 - 690	3 - 15	180 - 240
hard	770 - 970	680 - 900	2 min.	230 - 310
spring	960 min.	900 min.	-	280 min.

Physical properties

Modulus of elasticity	kN/mm ²	182.0
Poisson ratio		0.32
Density	g/cm ³	8.80
Melting point / Melting range	°C	1300 - 1350
Linear dilatation coefficient (0 - 100°C)	10 ⁻⁶ /°C	13.9
Thermal conductivity at 20°C	W/m °K	23.0
Specific heat at 20°C	J/(kg. K)	452
Curie Temperature	°C	20.0 - 50.0
Electrical resistivity at 20°C	μΩcm	51.3
Electrical conductivity at 20°C	MS/m	19.8
Electrical conductivity at 20°C	% IACS	34.0
Magnetic properties		Moderated in annealed temper.

Tolerances (strip and foil)

Thickness	Thickness (mm)		EN Standard		Lamineries MATTHEY		
	≥	<	10140 Precision	10258 Precision	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	-	± 0.003	± 0.003	± 0.0025	± 0.002
	0.065	0.100	-	± 0.004	± 0.004	± 0.0035	± 0.003
	0.100	0.125	± 0.005	± 0.006	± 0.005	± 0.004	± 0.003
	0.125	0.150	± 0.005	± 0.006	± 0.005	± 0.005	± 0.004
	0.150	0.250	± 0.010	± 0.008	± 0.008	± 0.006	± 0.004
	0.250	0.300	± 0.010	± 0.009	± 0.009	± 0.007	± 0.005
	0.300	0.400	± 0.010	± 0.010	± 0.010	± 0.007	± 0.005
	0.400	0.500	± 0.015	± 0.012	± 0.012	± 0.008	± 0.006
	0.500	0.600	± 0.015	± 0.014	± 0.014	± 0.010	± 0.007
	0.600	0.800	± 0.015	± 0.015	± 0.015	± 0.010	± 0.007
	0.800	1.000	± 0.015	± 0.018	± 0.018	± 0.012	± 0.009
	1.000	1.200	± 0.020	± 0.020	± 0.020	± 0.015	± 0.012
	1.200	1.250	± 0.020	± 0.020	± 0.020	± 0.015	± 0.012
1.250	1.500	± 0.020	± 0.020	± 0.020	± 0.015	± 0.014	
Width	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.						
Camber	Width (mm)		Camber max. (mm/m)				
<p>Our tolerance "LMSA Standard" respects the EN Standard 1654 (Length of measurement 1000 mm). Other tolerances upon request.</p>	>	≤	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		
Surface	Special surface qualities upon request						
Flatness	Special requirement on the longitudinal or transversal flatness upon request						

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