

Désignation	FeNi36	EN	UNS (ASTM)	AISI	LMSA
		1.3912	≈ K93600	-	<b>F240</b>

## Chemical composition

Fe	Ni	Si	Mn	C	P	S	Cr	Co
Reste	35.0 - 37.0	≤ 0.40	≤ 0.60	≤ 0.15	≤ 0.025	≤ 0.025	≤ 0.25	≤ 0.50

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

Invar® (FeNi36) belongs to the family of iron-nickel alloys with a very low coefficient of thermal expansion. This alloy has a face-centered cubic structure with a content 36 % Nickel and 64 % Iron, approximately. Invar® alloy is well known for exhibiting an extremely low coefficient of thermal expansion, from absolute zero (-269 °C) to 200 °C. This alloy is mainly used in applications where a high dimensional stability is required over temperature variation, such as, laser systems, optical systems, OLED displays, thermostats, etc. In dry atmospheres and at room temperature FeNi36 alloy shows good corrosion resistance. However, its corrosion resistance declines in humid environments. This alloy has high ductility and toughness. It can be easily welded.

Lamineries MATTHEY produces the Alloy Invar® (FeNi36), in precision cold-rolled product forms (strip and sheet).

## Typical uses

The main applications are: laser systems, optoelectronic industry, OLED screens, thermostats, components for the automotive industry, aircraft controls, physical measuring instruments, electronic devices, watchmaking, containers for LNG tankers, and cryogenic components.

## Typical manufacturing range

	Thickness (mm)	Width (mm)	Length (mm)
<b>Rolled products</b> Strip in coils <sup>[1]</sup>	0.010 - 0.400	1.5 - 200.0	-
Strip as sheets <sup>[1]</sup>	0.015 - 0.400	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> )	A <sub>50mm</sub> (%)	Hardness HV
R400	H110	soft	400 - 550	-	110 - 170
R600	H180	hard	600 - 800	-	180 - 260
R900	H280	extra hard	900 min.	-	280 min.

## Physical properties

Modulus of elasticity	kN/mm <sup>2</sup>	140
Density	g/cm <sup>3</sup>	8.13
Melting point	°C	1450
Linear dilatation coefficient	10 <sup>-6</sup> /°C	1.8 (-240 to -18°C) / 1.1 (20 to 50°C) / 1.4 (20 to 100°C) 1.9 (20 to 150°C) / 2.5 (20 to 200°C) / 3.6 (20 to 250°C)
Thermal conductivity at 20°C	W/m °K	10.5
Electrical resistivity	μΩcm	75
Specific heat	J/(kg. K)	515
Curie temperature	°C	230

## 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.					
Camber	Width (mm)		Camber max. (mm/m)			
	>	≤	LMSA standard		LMSA extreme	
<p>Our tolerance "LMSA Standard" respects the EN Standard 1654 (Length of measurement 1000 mm). Other tolerances upon request.</p>	3	6	≤ 0.5 mm	> 0.5 mm	≤ 0.5 mm	> 0.5 mm
	6	10	12	-	6	-
	10	20	8	10	4	5
	20	250	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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