ASTM A753, DIN 17405, IEC 404, JIS C 2531	UNS K94840 Alloy type 2	LMSA F112

Chemical composition (Weight %)

Fe	Ni	C	Co	Mo	Cu	Mn	Si	Cr	P	S
Bal.	47.0-49.0	≤ 0.05	≤ 0.50	≤ 0.30	≤ 0.30	≤ 0.80	≤ 0.50	≤ 0.30	≤ 0.03	≤ 0.01

In order to achieve maximum homogeneity and consistent quality, the actual tolerances on both alloy components and impurities are significantly tighter and more precisely defined than the standard composition indicated.

Typical chemical composition (Weight %)

Ni	Mn	Si	C	Cr	Fe
47.5	0.5	0.1	0.005	-	Bal.

Main technical properties and features

Lamineries MATTHEY SA produces the Alloy SUPRA50®, K94840 Alloy type 2, in precision cold-rolled product forms (strip and sheet).The different soft magnetic alloys having about 50% of Ni present the maximum saturation induction level attainable in the Fe-Ni system. The SUPRA50®, K94840 Alloy type 2 (isotropic quality) concern all the common applications, its typical coercive field value: Hc = 2.8 A/m. The best magnetic properties are obtained after optimum heat treatment, in compliance with the following standards: ASTM A596 and EN 10252.

Typical manufacturing range

		Thickness (mm)	Width (mm)	Length (mm)
Rolled products	Strip in coils [1)]	0.010 – 0.400	1.5 - 200.0	-
	Strip as sheets [1)]	0.015 – 0.400	10.0 - 200.0	100 - 3000

1) Not all our production possibilities are presented here. Other dimensions or other product forms available upon request. Certain combinations of thicknesses and widths are not possible.

Mechanical properties of strips

Temper		$Rp_{0.2}$ (N/mm^2)	Rm (N/mm^2)	A_{50mm} (%)	HV
R400	soft annealed	120-350	400-650	≥ 25	90-170
R650	½ hard	400-750	650-900	≥ 3	160-270
R1200	hard	Min.720	900-1200		260-350

Typical uses

The main applications are relays (for ground fault circuit breakers and railway signalling, for example), stepper motors for watches, safety caps for gas equipments, shielding, magnetic sensors (current, angular position, displacement) and aeronautical engineering (hyper-frequency oscillators).

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Physical properties

Modulus of elasticity	KN/mm^2	130-170
Density	kg/dm^3	8.2
Melting point / Melting range	°C	1425
Linear dilatation coefficient (20-100°C)	10^{-6}/ °C	8.0
Thermal conductivity at 20°C	W/m °K	13
Electrical resistivity	μΩcm	45
Electrical conductivity	MS/m	2.22
Specific heat at 20°C	J/(kg K)	500
Curie point	°C	450
Saturation induction at 20°C	Tesla	1.6
Coefficient of magnetostriction at saturation	$\Delta l/l\ 10^{-6}$	24

Magnetic properties*

Conditions	Thickness (mm)	Saturation induction (G - T at 10 Oe ~ 800 A/m)	Coercive force (Oe - A/m)	Permeability	Losses (W/kg) 400Hz - 1T
DC	0.35	15000 - 1.50	0.035 - 2.8	μ_{max} : 200000	-
AC	0.35	15000 - 1.50	-	μ5z:12500	0.15

* Typical values measured on rings sample thickness 0.350mm after annealing treatment at 1150°C in dry pure hydrogen cooling rate not critical, 50 to 100°C/hour.

Heat treatment of finished parts

The optimum magnetic properties for the Alloy SUPRA50®, K94840 Alloy type 2 is obtained by high temperature heat treatment on the finished components. The treatment is initially designed to recrystallize the metal. The treated parts must be handled with care, in order to avoid all plastic deformation which will degrade the magnetic properties. A protective atmosphere is essential to avoid oxidation. The use of pure dry hydrogen is recommended. The parts to be treated must be degreased and cleaned before annealing. The inert powder (alumina or magnesia) often used to avoid direct contact between different parts must be perfectly anhydrous. A high temperature promotes both coarsening of the primary grains and purification of the metal. The optimum heat treatment is 4 hours at 1150°C in pure dry hydrogen.

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Tolerances

Thickness

The table shown is an outline of our typical thickness tolerances available, which are tighter than industry standards.

Our "Precision" and "Extreme" tolerances are available upon request.

Thickness (mm)		Lamineries MATTHEY SA		
≥	<	LMSA Standard	LMSA Precision	LMSA Extreme
	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

Width

Our width tolerance is + 0.2 -0.0 mm (or ± 0.1 mm upon request). They are available for slit widths < 125 mm and thicknesses < 1.00 mm. Special tolerances upon request.

Camber

Our tolerance "standard" respects the EN Standard 1654 (Length of measurement 1000 mm).
Other tolerances upon request.

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

Surface

Special surface qualities upon request

Flatness

Special longitudinal or transversal flatness requirements upon request

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