LAMINERIES MATTHEY
NOTZ group advanced metal solutions

SUPRA50®

International Standards	UNS	LMSA
ASTM A753, DIN 17405, IEC 404, JIS C 2531	K94840 Type 2	F112

Chemical composition

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

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

Supra50® is an iron-nickel soft magnetic alloy, containing about 50 % of Ni. At this nickel content, the alloy reaches 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 is Hc= 2.8 A/m. The optimal magnetic properties are obtained after heat treatment, in compliance with the following standards: ASTM A596 and EN 10252.This alloy presents a good compromise between magnetic properties (saturation induction, coercive field, permeability) and corrosion resistance.

Lamineries MATTHEY produces the Alloy SUPRA50®, K94840 Alloy type 2, in precision cold-rolled product forms (strip and sheet).

Typical uses

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

Typical manufacturing range

		Thickness (mm)	Width (mm)	Length (mm)
Rolled products	Strip in coils [1]	0.010 -1.000	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 product forms available upon request. Some combinations of thicknesses and widths are not possible.

Mechanical properties of strips

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

Physical properties

Modulus of elasticity	kN/mm^2	130 - 170
Density	g/cm^3	8.2
Melting point	°C	1425
Linear dilatation coefficient	10^{-6}·/ ºC	8.0
Thermal conductivity at 20°C	W/m °K	13
Electrical resistivity	μΩcm	45
Electrical conductivity	MS/m	2.22
Specific heat	J/(kg. K)	500
Curie temperature	ºC	450
Saturation induction at 20ºC	Tesla	1.6
Magnetostriction coefficient at saturation	Δl/l 10^{-6}·	24

Magnetic properties [1]

Conditions	Thickness (mm)	Saturation induction (G - T at 10 Oe ≈ 800A/m)	Coercive force (Oe - A/m)	Permeability	Losses (W/kg) 400Hz - 1T
DC	0.35	15000 - 1.50	0.035 - 2.8	μ_{max}: 200 000	-
AC	0.35	15000 - 1.50	-	μ_{5z}: 12500	0.15

[1] 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 are 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.

Tolerances (strip and foil)

Thickness

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

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

Thickness (mm)		Lamineries MATTHEY		
≥	<	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 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

Our tolerance "LMSA 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 requirement on the longitudinal or transversal flatness upon request

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