

International Standards
ASTM A753, DIN 17745, IEC 404, JIS C 2531

UNS
N14080 Type 4

LMSA
F107

Chemical composition

Fe	Ni	C	Mo	Co	Cu	Mn	Si	Cr	P	S
Balance	79.0 - 82.0	≤ 0.05	3.50 - 6.00	≤ 0.50	≤ 0.30	≤ 0.80	≤ 0.50	≤ 0.30	≤ 0.02	≤ 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

Permimphy®, N14080 type 4 alloy is a soft magnetic alloy containing approximately 80 % Ni and 5 % molybdenum. The presence of molybdenum increases the magnetic permeability. The high nickel content allows the use of this material without the need of a corrosion resistant coating. This alloy has a saturation polarization of about 0.8 Tesla, the highest technically feasible permeability, and a very low coercive force, the material saturates at low magnetic fields. This gives it low hysteresis losses when used in AC magnetic circuits.

Permimphy®, N14080 type4 alloy has good ductility and is easy to cold work, allowing it to be easily formed into thin sheets needed for magnetic shields. The high permeability of this alloy provides a low reluctance path to the magnetic flux, which explains its use in magnetic shields against static or slowly varying magnetic fields. Magnetic shields made from high permeability alloys such as Permimphy®, do inhibit the magnetic fields, but offers the path for the magnetic field lines surrounding the shielding region. This creates a field depletion in the shielded area.

The Lamineries MATTHEY produces the alloy Permimphy®, N17080 type 4 (according to ASTM 753)., 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), AC magnetic circuits.

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	R _m (N/mm ²)	R _{p0.2} (N/mm ²)	A _{50mm} (%)	Hardness HV
R500 soft annealed	500 - 700	200 - 450	25 min.	100 - 190
R680 ½ hard	680 - 950	450 - 750	3 min.	150 - 250
R900 hard	900 - 1200	850 min.	-	210 - 300

Physical properties

Modulus of elasticity	kN/mm ²	190 - 221
Density	g/cm ³	8.7
Melting point	°C	1450
Linear dilatation coefficient	10 ⁻⁶ /°C	12.0
Thermal conductivity at 20°C	W/m °K	19
Electrical resistivity	μΩcm	55
Specific heat	J/(kg. K)	460
Curie temperature	°C	420
Saturation induction at 20°C	Tesla	0.8

Magnetic properties ^[1]

Conditions	Thickness (mm)	Saturation induction (G - T at 10 Oe ≈ 800A/m)	Coercive force (Oe - A/m)	Permeability (à 5mOe ≈ 0.4A/m)
DC	1.00 - 0.04	7500 - 0.75	0.005 - 0.40	470000
DC	0.34 - 0.0134	7500 - 075	0.005 - 0.40	520000
A C 60 Hz	0.34 - 0.0134	-	-	75000

[1] Typical values measured on rings sample after annealing treatment at 1170°C in dry pure hydrogen cooling rate not critical.

Heat treatment of finished parts

The optimum magnetic properties for the Permimphy®, N14080 Type 4 alloy 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 between 800 and 1150°C in pure dry hydrogen.

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		
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)			
	>	≤	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	
Our tolerance "LMSA Standard" respects the EN Standard 1654 (Length of measurement 1000 mm). Other tolerances upon request.						
Surface	Special surface qualities upon request					
Flatness	Special requirement on the longitudinal or transversal flatness upon request					

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