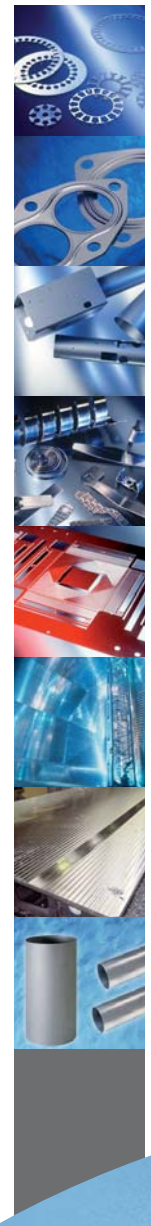
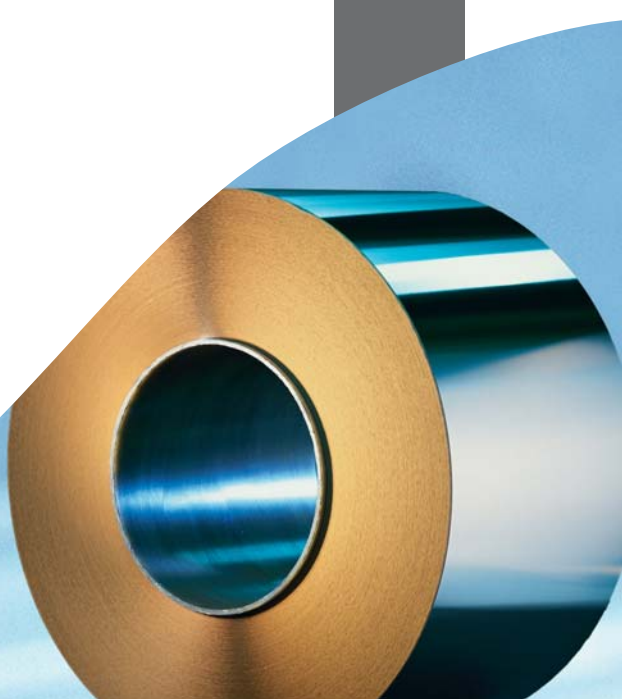
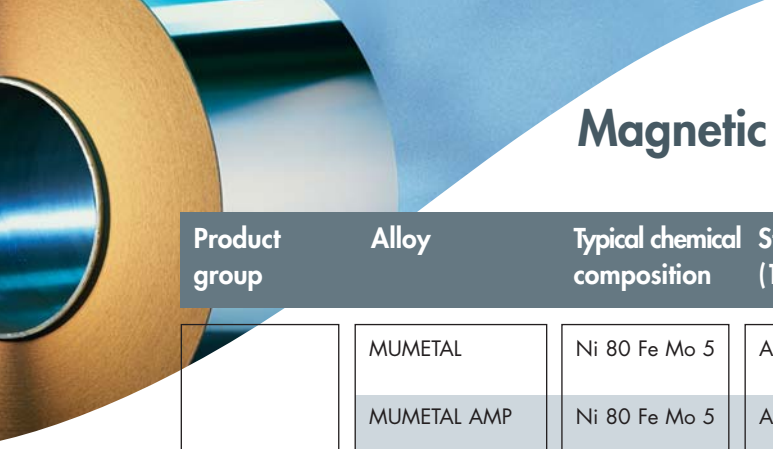
IMPHY ALLOYS
Arcelor Group



Product catalogue





Magnetic alloys

Product group	Alloy	Typical chemical composition	Standards (1)	Principal properties	Typical applications
Soft Ni-Fe magnetic alloys with very high permeability and low coercivity	MUMETAL	Ni 80 Fe Mo 5	A.D.I.J.M.	High permeability	. Magnetic shielding . Pole pieces
	MUMETAL AMP	Ni 80 Fe Mo 5	A.D.I.J.M.	Ready-to-use material	. High-performance magnetic shielding
	PERMIMPHY PERMIMPHY SP	Ni 80 Fe Mo 5	A.D.I.J.M.	. High permeability, low loss, . Enhanced stampability	. Current sensing cores . Watch motor components . Rotor/stator laminations for synchroresolvers
	PERMIMPHY R2 / PERMIMPHY B2	Ni 81 Fe Nb Mo 1	D.I.J.	. High wear resistance . Reduced magnetic deterioration due to coating stresses / enhanced saturation induction	. Recording head cores
	SUPERMIMPHY L	Ni 80 Fe Mo 5	A.D.I.J.M.	Very high permeability	. Stacked laminations for earth leakage circuit breakers . Profiled laminations for modem transformers
	SUPERMIMPHY LLS	Ni 81 Fe Mo 6	D.I.J.	High linear permeability, relatively unsusceptible to stress	. Stacked laminations for earth leakage circuit breakers . Choke and transformer cores . Profiled laminations for modem transformers . Laminations and stacked laminations for repeater coils . Current sensing cores
	SUPERMIMPHY T	Ni 80 Fe Mo 5	A.D.I.J.M.	Very high permeability	. Earth leakage circuit breaker cores . Current sensors
	SUPERIMPHY TLS	Ni 81 Fe Mo 6	A.D.I.J.M.	Very high permeability, relatively unsusceptible to stress	. Earth leakage circuit breaker cores . Current sensors
Soft Ni-Fe magnetic alloys with high permeability and high saturation induction	SUPRA 36	Fe Ni 36	D.I.J.	Good permeability, high resistivity	. Laminations for repeater coils . Magnetic shielding . High frequency transformer cores
	SUPRA 40	Fe Ni 40	J.	. Enhanced permeability and saturation induction . Excellent stampability	. CRT gun grids . Alarm clock motor components . Automotive injectors
	SUPRA 50 / SUPRA 50 SP	Fe Ni 48	A.D.I.J.	. High permeability and saturation induction . Low loss	. Polar pieces, components for relays, components for safety caps . Magnetic shielding . Alarm clock motor components . Watch motor components . Rotor/stator laminations for micromotors and synchro resolvers . Relay components for earth leakage circuit breakers. . Automotive sensors and actuators
	SUPRA 50 G / SUPRA 50 GSP	Fe Ni 48	A.D.I.J.	. High permeability and saturation induction . Enhanced stampability	. Watch motor components . CRT gun grids . Automotive actuators
	SUPRA 50 T	Fe Ni 48	A.D.I.J.	. Very high permeability, high saturation induction . Giant-grained recrystallisation	. Profiled laminations for bonded stacks for high-performance repeater coils . Earth leakage circuit breaker cores
	SP 510	Ni 50 Fe Cr 9		. Saturation induction close to that of Fe-Ni80% alloys, low coercivity . Good corrosion resistance	. Stepper motor stators

(1) A= ASTM A 753 ; D= DIN 17405 ; I=IEC 404 ; J=JIS C 2531 ; M=MIL 14411

Magnetic alloys

Product group	Alloy	Typical chemical composition	Standards (1)	Principal properties	Typical applications
Soft Co-Fe magnetic alloys with very high saturation induction	AFK 1	Fe Co 25	ASTM A801 I	. Very high saturation induction . High ductility	. High power-to-weight ratio motor and generator laminations . Pole pieces
	AFK 502 R	Fe Co 49 V	ASTM A801 I	. Very high saturation induction . High resistivity / high yield strength . High magnetostriction	. High power-to-weight ratio motor and generator laminations . Pole pieces . Impact printer components . Magnetostrictive sensors . High power-to-weight ratio transformer laminations
	AFK 18	Fe Co 18	ASTM A801 I	. Very high saturation induction . High electrical resistivity . Magnetostriction λs = 25 ppm	. High power-to-weight ratio motor and generator laminations . Pole pieces . Impact printer components . Laminations for actuators (automotive) . High power-to-weight ratio transformer laminations
Ni-Fe temperature compensating magnetic alloys				Curie point	
	PHYTHERM® 30	Fe Ni 30	I	30°C	
	PHYTHERM® 50	Fe Ni 30	I	50°C	. Electricity meters . Speedometers . High precision sensors . Measuring equipment . Induction cooking utensils
	PHYTHERM® 70	Fe Ni 30	I	70°C	
	PHYTHERM® 90	Fe Ni 30	I	90°C	
	PHYTHERM® 230	Ni 50 Fe Cr 10	I	230-250°C under development	
	PHYTHERM® 260	Ni 50 Fe Cr 9	I	260°-280°C under development	

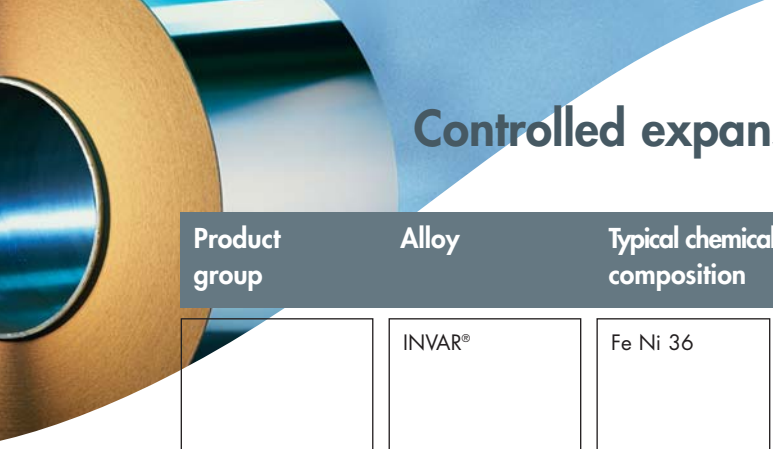
(1) A= ASTM A 753; D= DIN 17405; I=IEC 404; J=JIS C 2531; M=MIL 14411

Special alloys

Product group	Alloy	Typical chemical composition	Standards	Principal properties	Typical applications
High yield strength alloys	PHYNOX	Co Cr 20 Ni 17 Fe 14 Mo 7 Mn	-	. Excellent mechanical properties up to 450°C . Excellent resistance to fatigue and stress relaxation . Excellent corrosion resistance (saltwater, acids…) . Inert in respect of human tissue . Non-magnetic	. Mechanical watch movement mainspring . Springs for chemical, oil, aeronautics and space equipment . High reliability spring components for the automotive industry . Miscellaneous components for the defence industry . Prostheses and medical apparatus
	DURIMPHY	X 2 Ni Co Mo Ti-18-9-5	-	. Maraging steel with excellent mechanical properties up to 400°C . Good formability and weldability . Hardening by heat treatment without dimensional impact . Good fatigue resistance . Excellent response to nitriding	. Form springs for watches . Automatic gearbox belt . Ball bearing cages . Rocket fins
	DURPHYNOX	Fe Cr 12 Ni 9 Cu 2	AMS 5860 D	. Excellent mechanical properties up to 450°C . Good corrosion resistance	. CRT springs . Metal gaskets . Automotive actuators

Special alloys (cont'd)

Product group	Alloy	Typical chemical composition	Standards	Principal properties	Typical applications
Superalloys	NICRIMPHY 600	Ni Cr Fe 9	Woff 2.4816 AMS 5540 ASTM B 168 NC 15 Fe	. Good resistance to high-temperature oxidation . Good high-temperature mechanical properties . Good formability . Non-magnetic	. Electron gun components (bulb spacer and getter holder) . Welded rolled tubes . Miscellaneous chemical industry equipment . Airbag gas generator membranes . Automotive engine and exhaust gaskets . Clamps . Sheets for furnace muffles
	NICRIMPHY 601	Ni Cr 23 Fe Al	2.4851	. Excellent resistance to high-temperature oxidation . Good high-temperature mechanical properties . Good formability . Non-magnetic	. Engine gaskets . Automotive spark plugs . Sheets for furnace muffles
	SUPERIMPHY 286	X 4 Ni Cr Ti 25-15	AISI 660 S 66286 1.4943 A 286	Resistance to high-temperature oxidation and corrosion	. Automotive exhaust gaskets . Clamps . Flanges, tubes, fasteners for chemical and petrochemical industries
	SUPERIMPHY 625	Ni Cr 22 Mo 9 Nb	AISI 625 N26625 2.4856	Resistance to wet corrosion and high-temperature oxidation	. Airbag gas generator membranes . Automotive exhaust gaskets . Flanges, tubes, fasteners for chemical and petrochemical industries
	SUPERIMPHY 718	Ni Cr 19 Fe Nb	UNS 07718 2.4668	Very good resistance to creep up to 700°C and to high-temperature oxidation in harsh environments	. Exhaust gaskets . Clamps
	SUPERIMPHY 825	Ni 40 Cr 22 Fe Mo	AST B 423 AST B 425 UNS N08825 2.4858	Excellent corrosion resistance	. Flanges, tubes, fasteners for chemical and petrochemical industries
Electrical resistance alloys	GILPHY 45	Fe Ni 45 Cr 23	-	. Excellent creep resistance . Very good high-temperature corrosion resistance . Very good formability Non-magnetic	. Rail traction braking rheostats . Electrical resistors for thermal circuit breakers . Industrial electric furnaces
	GILPHY 80S	Ni Cr 20	-	. Good mechanical properties and corrosion resistance up to 800°C . Good pressability . Non-magnetic	. Cathodes for cathode ray tubes
Welding alloys	PHYCOFE	Co Fe 5	-	. Good formability . High cobalt content	. Flux-cored hardfacing wires (stellite)



Controlled expansion alloys

Product group	Alloy	Typical chemical composition	Standards	Principal properties	Typical applications
Fe Ni	INVAR®	Fe Ni 36	DIN 1715 W 1.3912 A 54 – 301 SEW 385	Very low expansion coefficient in the temperature range between 20°C and 100°C: αm = 1,1 10^{-6}/°C	. Moulds for composite components . Piezoelectric injectors . Shadow masks and frames for cathode ray tubes . Echoboxes and filters for mobile phone network relay stations
	INOVAR	Fe Ni 36	DIN 1715 W 1.3912 A 54 – 301 SEW 385	Expansion coefficient lower than that of Invar®. αm between 20°C and 100°C = 0,8 10^{-6}/°C	Shadow masks for cathode ray tubes
	INVAR® M93	Fe Ni 36	A 54 – 301	. Low expansion coefficient between –185°C and 0°C. . Elevated mechanical properties at cryogenic temperatures	. Gas carrier tank membranes . Liquefied natural gas loading and discharge pipes
	N 42	Fe Ni 42	ASTM F30 DIN 17745 W 1.3917 A 54 – 301 SEW 385	Expansion coefficient suited to silicon (integrated circuits), ceramics (aluminates) and hard glass	. Integrated circuit lead frames . Electron gun components . Hermetic seals on glass and ceramics . Enamelled resistor ferrules . Moulds for composite parts
	N 48	Fe Ni 48	ASTM F30 DIN 17745 W 1.3922 A 54 – 301	Expansion coefficient suited to soft glass used for hermetic seals in electronics	. Hermetic feedthroughs . Electron gun components
	N 52	Fe Ni 52	ASTM F30 W 2.4478 A 54 – 301	Expansion coefficient suited to soft glass used for hermetic seals in electronics	. Hermetic feedthroughs . Reed relays . Miscellaneous glass-metal seals . Electronic components
Fe Ni Cr	N 475	Fe Ni 47 Cr 5	A 54 – 301	Expansion coefficient suited to soft glass	. Cathode ray tube anode buttons
	N 485	Fe Ni 48 Cr 5	DIN 17745 W 2.4486	Expansion coefficient suited to soft glass	. Cathode ray tube anode buttons . CRT gun current leads
Fe Ni Co	DILVER P1	Fe Ni 29 Co 17	ASTM F15 DIN 17745 W 1.3981 A 54 – 301 SEW 385	Expansion coefficient suited to borosilicate glass and ceramics employed in electronics	. Hybrid circuit casings . Transistor and opto-electronic component cases and bases . Electronic tubes (power, X-ray...) . Hermetic feedthroughs . SAW filters . Oscillator housings . CRT electron gun components

Bimetals

Product group	Alloy	Typical chemical composition	Standards	Principal properties	Typical applications
Thermostatic bimetals	AS	B6M / INVAR®	DIN 1715	Standard DIN grade K = 28.5 10^{-6} / °C	**Temperature indicating equipment** . Thermometers **Temperature control** . Thermostats for domestic electrical appliances . Room thermostats . Mixer taps **Timers and temperature control** . Cigar lighters, toasters **Safety** . Thermal circuit breakers . Thermal relays . Miniature temperature/current overload protectors **Temperature compensation** . Bimetallic temperature compensators for CRTs
	R80	NC4 / INVAR®	ASTM B 344	Standard ASTM grade K = 26.5 10^{-6} / °C	
	108 SP	B72M / INVAR®	DIN 1715	High deflection K = 39 10^{-6} / °C	
	AS Series	B6M / Ni or Cu / INVAR®	DIN 1715	Resistivity values from 0.78 µohm.m to 0.06 µohm.m	
	R 80 Series	NC4 / Ni or Cu / INVAR®	ASTM B 344	Resistivity values from 0.79 µohm.m to 0.04 µohm.m	
	SP Series	B72M / Ni or Cu / INVAR®	-	Resistivity values from 1.40 µohm.m to 0.05 µohm.m	
	BS	B6M / N42	DIN 1715	High linearity limit up to 380°C K = 22 10^{-6} / °C	
	BS9	B6M / Cu / N42	DIN 1715	As BS with high thermal conductivity (ρ = 0.09 µohm.m	
	BSP	B72M / N42	ASTM B 344	As BS with high specific deflection K = 33 10^{-6} / °C	
Bimetal components	B72M	Mn Cu 18 Ni 10	ASTM B 753 T-10	Very high expansion coefficient	Thermostatic bimetals
	B6M	Fe Ni 20 Mn 6	ASTM B 753 T-20	High expansion coefficient	
	NC4	Fe Ni 22 Cr 3	ASTM B 753 T-22	High expansion coefficient	
	INVAR®	Fe Ni 36	ASTM B 753 T-36	Low expansion coefficient	
	N42	Fe Ni 42	ASTM B 753 T-42	Low expansion coefficient	
	Nickel 201	Ni 99	ASTM B 162-99 DIN 17740 2.4068	Low carbon Controlled resistivity	