NIPLATE® 500 PTFE
ELECTROLESS NICKEL PLATING WITH PTFE

Niplate 500 PTFE is a composite coating of high phosphorus (10-13%) electroless nickel containing 25-35% of PTFE particles.

PTFE nanoparticles are co-deposited in the matrix during deposition of the nickel film. The film is thus composed of a nickel-phosphorus alloy matrix in which the PTFE particles are uniformly dispersed.

PTFE is a polymer with certain specific properties. It is completely chemically inert and immune from attack by almost all chemical compounds. It offers excellent surface smoothness, a low friction coefficient, and non-stick properties.

The Niplate 500 PTFE coating thus combines the intrinsic properties of electroless nickel and PTFE. It offers hardness values on a par with steel, together with low friction coefficient and releasability characteristics.

The low friction coefficient recommends the material for applications with sliding parts, such as solenoid valve tube assemblies and moving cores, and technical gas pressure reducer components. The non-stick property makes the coating suitable for use in the plastic moulding and forming sector, and in metering and control devices for viscous liquids, adhesives, and hot water.

LOW FRICTION COEFFICIENT AND NON-STICK PERFORMANCE

Thanks to the high contents of uniformly distributed PTFE particles, the coating offers excellent non-stick properties and a very low friction coefficient (0.08 ÷ 0.12) without lubrication.

UNIFORM THICKNESS

Uniform and constant coating thickness over the entire substrate, including holes: ideal for precision machined parts with tight tolerances.

CAN BE APPLIED ON VARIOUS METALS

All metals commonly used in mechanical engineering practice can be coated: alloys of iron, copper, and aluminium.

TECHNICAL SPECIFICATIONS

COMPOSITION AND APPLICABLE STANDARDS

COMPOSITION			
The Niplate 500 PTFE coating is composed of two layers of identical thickness: the first layer is medium phosphorus electroless nickel, and the second is high phosphorus electroless nickel with PTFE particles.			
FIRST LAYER (40-60% OF TOTAL THICKNESS)	Ni	P	
	91÷95%	5÷9%	
SECOND LAYER (40-60% OF TOTAL THICKNESS)	MATRIX		PARTICLES
	NI	P	PTFE 300NM
	87÷90%	10÷13%	25÷35% vol.
Composite coating with electroless nickel matrix and PTFE particles.			

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NSF 51 CERTIFICATION
NSF 51 certification - Food equipment material.

ROHS COMPLIANCE
RoHS compliant. No restricted substances present in amounts greater than the maximum tolerated concentrations.

REACH COMPLIANCE
REACH compliant. No SVHCs present in amounts higher than 0.1% by weight.

COATABLE METALS

IRON ALLOYS		CHARACTERISTICS
Carbon steel	Adhesion	★★★★★
	Corrosion resistance	★★★☆☆
Stainless steel	Pre-treatment	Sand blasting
	Adhesion	★★★★☆
	Corrosion resistance	★★★★★
Case hardened steel	Pre-treatment	Sand blasting
	Adhesion	★★★★☆
	Corrosion resistance	★★★☆☆
Nitrided steel	Pre-treatment	Sand blasting
	Adhesion	★★★☆☆
	Corrosion resistance	★★★☆☆

COPPER ALLOYS		CHARACTERISTICS
Brass, Bronze, Copper	Adhesion	★★★★★
	Corrosion resistance	★★★★★

ALUMINIUM ALLOYS		CHARACTERISTICS
Machining alloys	Adhesion	★★★★☆
	Corrosion resistance	★★★★☆
Foundry alloys	Adhesion	★★★★☆
	Corrosion resistance	★★★☆☆

TITANIUM ALLOYS		CHARACTERISTICS
Pure titanium and titanium alloys	Pre-treatment	Sand blasting
	Adhesion	★★★★☆
	Corrosion resistance	★★★★★

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COATING THICKNESS AND AESTHETIC APPEARANCE

COATING THICKNESS

TYPICAL THICKNESS	TOLERANCE
15µm	±3µm
Uniform thickness over the entire external and internal surface	
Absence of tip effect typical of galvanic coatings	

AESTHETIC APPEARANCE

Grey gunmetal appearance due to high contents of PTFE particles. Reproduces the morphology of the machined part.

Option of matt finish (sand blasted, shoot peened, or grit blasted)

In case of hardening treatments carried out at 260-280°C, discoloration of the coating may occur with possible localized brown rings.

TRIBOLOGICAL PROPERTIES

HARDNESS

The surface hardness of Niplate 500 PTFE varies in accordance with the hardening heat treatment performed after deposition of the coating.

HARDNESS VALUE	HEAT TREATMENT
250±100HV	Hydrogen embrittlement relief at 160-180°C for 4h
300±100HV	Hardening at 260 -280°C for 8h

WEAR RESISTANCE

Niplate 500 PTFE features high wear resistance in the presence of non-abrasive conditions and in applications with low local loads. It is not suitable for abrasive wear applications. Consequently, the Taber Abraser test wear values tend to be high.

GUIDELINE WEAR VALUE, TWI-CS10	HEAT TREATMENT
THE LOWER THE NUMBER, THE HIGHER THE PERFORMANCE - ASTM B733 X1 - TABER ABRASER WEAR TEST - CS 10 ABRASIVE WHEELS - 1 KG LOAD	
33±2 mg / 1000 cycles	Hydrogen embrittlement relief at 160-180°C for 4h
21±2 mg / 1000 cycles	Hardening at 260 -280°C for 8h

FRICTION COEFFICIENT

DYNAMIC DRY FRICTION COEFFICIENT VALUE	
0.08 ÷ 0.12	Thanks to the high PTFE particle contents, the Niplate 500 PTFE coating offers a very low dry dynamic friction value usually ranging from 0.08 to 0.12 depending on the antagonist material.

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CHEMICAL PROPERTIES

CORROSION RESISTANCE

The corrosion protection of Niplate 500 PTFE, measured by means of the salt spray test, depends on the substrate metal, machining and finish of the part, and on the applied film thickness.

GUIDELINE CORROSION RESISTANCE VALUES	SUBSTRATE MATERIAL
NSS TO ISO 9227 - THICKNESS 20 µm - CORRODED SURFACE < 5%	
≥1000 hours	Brass
≥240 hours	Carbon steel
≥240 hours	Aluminium 6082

CHEMICAL RESISTANCE

Excellent chemical and oxidation resistance in highly aggressive saline environments. Passes the concentrated nitric acid immersion test (RCA nitric acid test: 42 degree Bé concentrated nitric acid, 30 seconds, ambient temperature).

CHEMICAL COMPATIBILITY

Chemical compatibility values are referred **exclusively** to the coating and **do not** define the corrosion protection of the substrate material. The overall performance of the coated part is highly dependent also on the type and quality of the substrate material. The actual environmental resistance must anyway be tested in the field.

✓	Hydrocarbons (e.g. petrol, diesel, mineral oil, toluene)
✓	Alcohol, ketones (e.g. ethanol, methanol, acetone)
✓	Neutral saline solutions (e.g. sodium chloride, magnesium chloride, seawater)
✓	Dilute reducing acids (e.g. citric acid, oxalic acid)
✕	Acid oxidizing agents (e.g. nitric acid)
✕	Concentrated acids (e.g. sulphuric acid, hydrochloric acid)
✓	Dilute bases (e.g. dilute sodium hydroxide)
✕	Base oxidizing agents (e.g. sodium hypochlorite)
✕	Concentrated bases (e.g. concentrated sodium hydroxide)

PHYSICAL PROPERTIES

WELDABILITY

Cannot be brazed

FERROMAGNETISM	HEAT TREATMENT
Ferromagnetic	Hydrogen embrittlement relief at 160-180°C for 4h
Ferromagnetic	Hardening at 260 -280°C for 8h

MAXIMUM CONTINUOUS WORKING TEMPERATURE

260°C

DENSITY

6.3 g/cm^3

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