

# TAILORCOAT® ENiP

Tribology Solutions



## DESCRIPTION

TAILORCOAT® ENiP is a nickel-phosphorus alloy that is deposited without current on workpieces true to contour, even on workpieces with complex geometries. It offers excellent wear and corrosion resistance properties. TAILORCOAT® ENiP has a phosphorus content of 6 – 12 wt%. This high phosphorus content makes the coating ductile and corrosion resistant. With heat treatment a recrystallization of the nickel phosphides is possible whereby the hardness of nickel phosphorus increases and results in an improved wear protection.

## DETAILS

The ENiP layer is deposited without current from electrolytes. It contains nickel phosphides to harden the microstructure for wear protection.



## TYPICAL APPLICATIONS

Typical areas of application include gear flanges, wheel hubs, ring sockets and ring nipples, axial and thrust washers, housings, pistons, valve pistons, partial hard nickel plating of coupling hubs and corrosion protection of high-performance heat sinks.

## APPLICATION PARAMETERS

Substrate material	carbon steel and low-alloy steels
Component dimensions	max. 950x500x700 mm (max. product window)
Layer thickness	3 – 50 µm (depending on ground roughness depth and corrosion protection specifications)
Phosphorus content	6 – 12% (different processes for mid- and high-phos layers)
Temperature limit	max. 650 °C (depending on base material)

## TAILORCOAT® ENiP PERFORMANCE CHARACTERISTICS

Resistance to wear	++
Friction reduction	+
Corrosion protection	++
Wear protection	++

Legend: 0 unchanged + improved ++ excellent

Note: All values are averaged and may vary. Final specification according to drawing and application.

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Innovation in Motion



## PROPERTIES BY PHOSPHORUS CONTENT

	TAILORCOAT® ENiP High phos > 10%	TAILORCOAT® ENiP Mid phos 6 – 9%
Density	7.6 – 7.9	8.0 – 8.2
Hardness in the deposition state	500 – 575 HV0.05	580 – 700 HV0.05
Hardness after tempering	850 – 950 HV0.05	850 – 1100 HV0.05
Thermal expansion coefficient	8 – 10 µm/m/°C	10 – 15 µm/m/°C
Electrical resistance	75 – 110 µohm/cm	40 – 70 µohm/cm
Thermal conductivity	0.010 cal/cm-1/sec-1/°C-1	0.012 cal/cm-1/sec-1/°C-1
Tensile strength	650 – 900 MPa	800 – 1000 MPa
Elongation at fracture	1 – 2%	< 1%
Melting point (°C)	880 – 900 °C	880 – 980 °C
Magnetism in the deposition state	nonmagnetic	slightly magnetic

## CORROSION PROTECTION BY PHOSPHORUS CONTENT: SALT SPRAY TEST IN ACCORDANCE WITH DIN EN ISO 9227

TAILORCOAT® ENiP High phos > 10%		TAILORCOAT® ENiP Mid phos 6 – 9%	
Layer thickness 25 to 50 µm	240 to 750 h	Layer thickness 7 to 12 µm	24 to 72 h
Layer thickness > 50 µm, good surface quality	1000 h	Layer thickness > 25 µm	48 to 120 h

## WEAR PROTECTION BY PHOSPHORUS CONTENT

	TAILORCOAT® ENiP High phos > 10%	TAILORCOAT® ENiP Mid phos 6 – 9%
Taber Wear Index (as deposited) (mg/1000 cycles – CS-10 disk, 10 N)	22 – 24	16 – 20
Dry sliding wear	++	+
Lubricated sliding wear	++	++
Erosion	++	++
Abrasion	+	++
Fretting	++	++

Legend: 0 unchanged + improved ++ excellent

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