

## Protalloy®

### For outstanding corrosion protection of steel

#### Special properties

- Extremely thin layer for maximum corrosion protection: 5µm Protalloy® provides more than 1000 hours of protection against red rust (NSS)!
- Hard topcoat (up to 550 HV \*) to ensure better scratch and wear resistance compared to electroplated zinc and zinc-iron.
- Thermal stability up to 200 °C.
- Corrodes sacrificially to steel (consistent stable corrosion behaviour).
- Stable and less voluminous corrosion by-products compared to zinc and zinc-iron.
- Excellent adhesive passivation layer and an optional topcoat.
- Excellent adhesion and coverage on cast iron (for example GGG40 / GGG50).
- Treatment of high strength steels like 42CrMo4 possible.
- Good basis for applying a (optical) topcoat like paint or powder coating.

#### Areas of application

Protalloy® offers an effective solution for corrosion resistance under extreme conditions and is intended for use in the agricultural, offshore, automotive, aerospace and industrial sectors.

#### Protalloy® is

- A total corrosion protection system for steel parts.
- Based on an electroplated zinc-nickel alloy with passivation and optional topcoat.
- Free of any hexavalent chromium and complies with the latest RoHS II directives (2011/65/EU).
- Partial surface treatment possible.

#### Some examples

- Hydraulic components: manifolds, cylinders, screw-in cartridges.
- Automotive components: trailer hitches, retaining brackets, gear parts.
- Offshore components: strips, hooks, pins.
- Machine components: casings, construction parts, gear wheels, pins, bushings.

### Protalloy® (zinc nickel) compared to standard zinc (iron) plating and electroless nickel

Coating type	Protalloy®	Zinc (or zinc-iron)	NiP (high phosphorus)
Process type	Electroplating	Electroplating	Electroless
Composition (%)	Zn: 84-90 / Ni: 10-16	Zn: 99-100 / Fe: 0-1	Ni: 88-90 / P: 10-12
Passivation (Cr6-free)	Transparent + topcoat	Clear or yellow	No
Typical coating thickness (µm)	5-15	5-15	10-50
Coating thickness tolerance (%)	to +300%	to +300%	± 2 µm
Attainability layer on the product	Exterior Interior very limited	Exterior Interior very limited	Wherever fluid and flow are present
Hardness (HV)	350 - 550 *)	100 - 150	500 - 600 **)
Density (kg/dm <sup>3</sup> )	7.40	7.10	7.90
Melting point (°C)	750 - 800	420	850 - 880
Weldability	Moderate	Poor	Moderate
Thermal stability	Excellent	Poor	Excellent
Base for paint adhesion	Good	Fair	Poor

#### Corrosion protection \*\*\*)

Protection against WR (hours)	120 - 240	120 - 240	N.A.
Protection against RR (hours)	> 1000	240 - 480	100 - 500

\*) Depending on the type of Zn-Ni process, alkaline Zn-Ni plating is harder than acid ZnNi plating

\*\*) As separated, hardness of more than 900 HV can be attained with heat treatment

\*\*\*) Testing hours of WR/RR on steel sample plate in Neutral Salt Spray test (NSS) according to ASTM B117

WR = White Rust = zinc corrosion / RR = Red Rust = metal base corrosion

Coating thickness of at least 5 microns with Protalloy and zinc (iron) and at least 25 microns with NiP

Hydraulic components



Offshore components



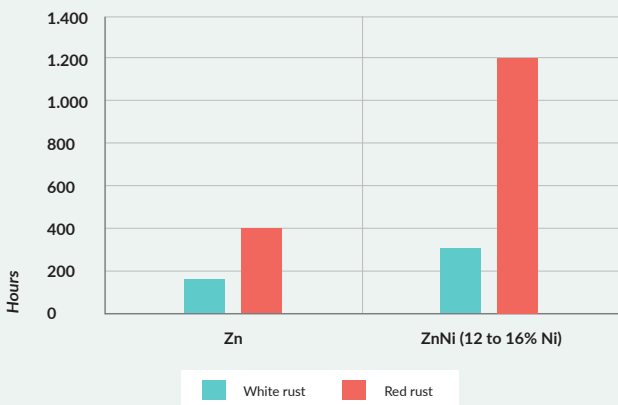
Automotive components



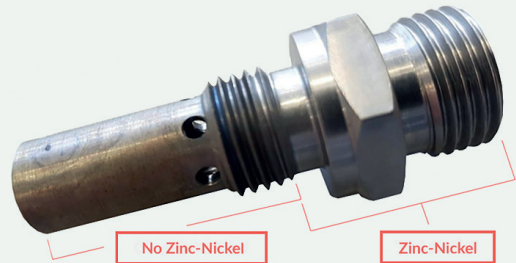
Machine parts



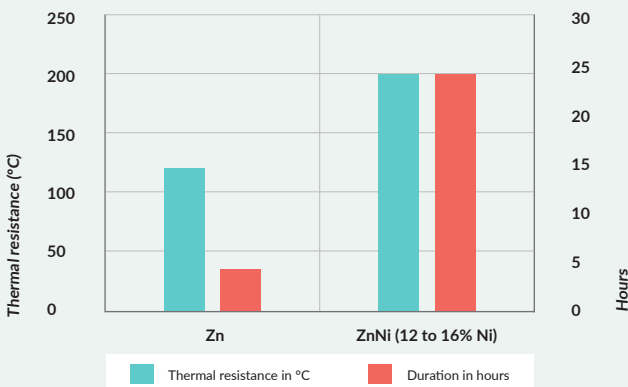
Comparing ZnNi and Zn coatings on corrosion resistance (Neutral Salt Spray (ASTM B117))



Partial surface treatment possible



Comparing ZnNi and Zn coatings on thermal resistance while maintaining corrosion performance



Comparing ZnNi and Zn coatings on cyclic corrosion performance (SAE J2334)

