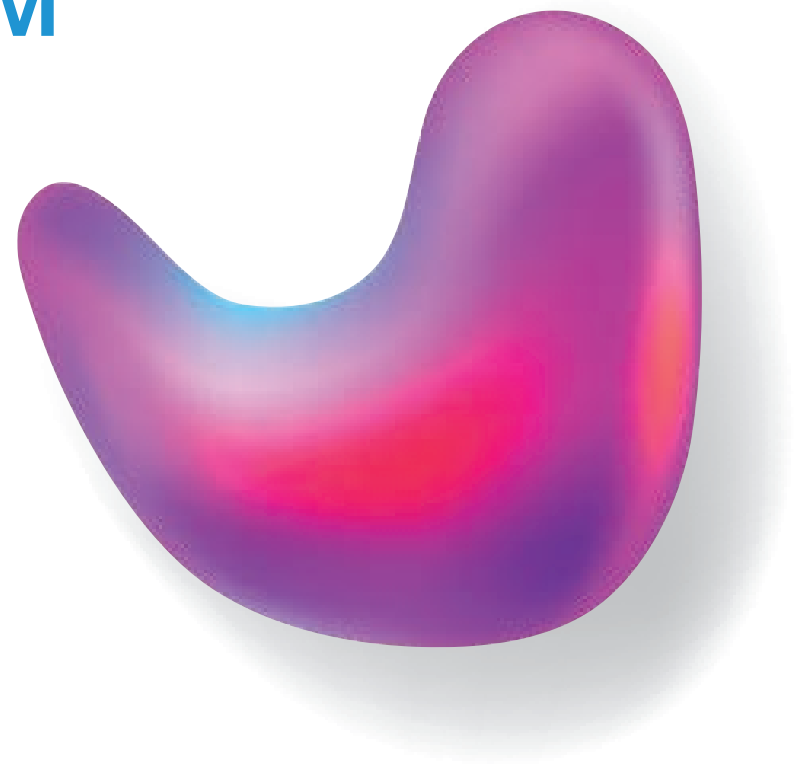
Coatings for heavy-duty wear protection in extremely demanding applications

DIAPROTECT®

THE POWER COATING FOR MAXIMUM WEAR PRO-TECTION

DIAPROTECT® ensures the long-lasting functionality of **systems and equipment** through high wear and corrosion resistance.



THE MOST IMPORTANT PLUS POINTS:

+ Heavy-duty wear protection with diamond
+ As a thin-film system (10-30 µ)
+ As thick-film system (30-100 µ) or higher
+ Protection against particle and chemical wear
+ Works on all substrates

CCT COATING SYSTEMS

If you have any questions or would like to place an order, please contact us at: T +49 (0)711 - 907 346 - 0

info@cct-plating.com
www.cct-plating.com

DIAPROTECT®

SOLUTION EXAMPLES

THERE IS ALWAYS A TAILOR-MADE SOLUTION

The requirements are different for each component. Our **DIA**PROTECT® coating process is flexible and robust in extreme areas of application. We adapt to your needs. Please feel free to get in touch.

*Further information on the function of **DIA**PROTECT can be found here or at www.cct-plating.com/diaprotect*

Wear protection in combination with corrosion

***DIA**PROTECT is the perfect solution when it comes to maximum wear protection.*

AT A GLANCE

TYPE:
Dispersion coating of electroless nickel-phosphorus or electroplated nickel or nickel-phosphorus.

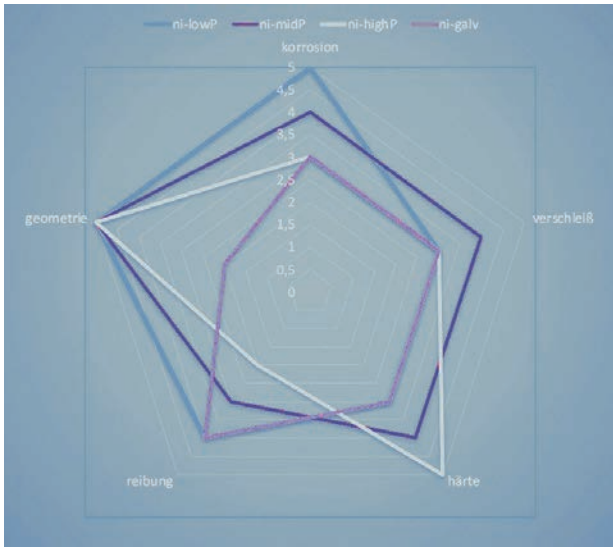
PROPERTIES:
> PROPERTIES: > Wear-resistant friction pairing of metallic components
> Adjustable hardness of the nickel-phosphorus layer (approx. 550 HV0.1 to approx. 1,100 HV0.1).
> High corrosion resistance with nickel and with nickel-phosphorus
> Good contour accuracy or very uniform coating thickness with electroless nickel
> High layer thicknesses when using electroplated nickel

USE:
Tribological pairings in systems subject to extreme stress with high friction and corrosion loads, such as in equipment for conveying raw materials in the petroleum industry, but also in equipment for manufacturing textile products.

COATING CHARACTERISTICS:
Nickel-phosphorus layer from approx.5 µm to approx. 300 µm with dispersion materials nano-dispersions (< 1 µm) up to dispersions > 1 - 12 µm.
Friction value µ = <0.3

SUBSTRATE CHARACTERISTICS:
Electro-platable base material with adapted, defined roughness

ADVANTAGES OF USING DIAPROTECT®-COATINGS



Overview of all advantages in the network diagram

+ **Heavy wear protection with diamond**
+ **As a thin-film system (10-30 µ)**
+ **As thick-film system (30-100 µ) or higher**
+ **Protection against particle and chemical wear**
+ **Works on all substrates**
+ **Effective combination** of the important properties of wear protection and corrosion protection of metal surfaces
+ **Cost reduction** compared to substrate material changes
+ **Can be used without design changes**
+ **Insensitivity to lubricants**
+ **Increase of the safety factor**

The dispersion coatings based on nickel and nickel-phosphorus are characterised by the fact that they have several important properties, or that **the properties can be adapted to the requirements of the application depending on the composition and/or heat treatment.** This can be illustrated by means of a network diagram for qualitative evaluation, on the basis of which the user can select the required properties.

APPLICATION

As a rule, there are movements between parts of equipment or sliding and friction processes between equipment and the products to be machined in a wide variety of equipment and systems. In the majority of cases, this results in more or less pronounced wear on parts of the equipment. Such wear loads can occur, for example, in equipment for the extraction of raw materials in the petroleum industry, but also in the manufacture of textile products. To maintain the functionality of equipment and systems, wear on such contact surfaces must be effectively prevented or reduced. Electroless and electroplated nickel and nickel-phosphorus coatings are very suitable as surface protection.

DIAPROTECT® coatings were specially developed to protect against heavy abrasive and chemical wear.

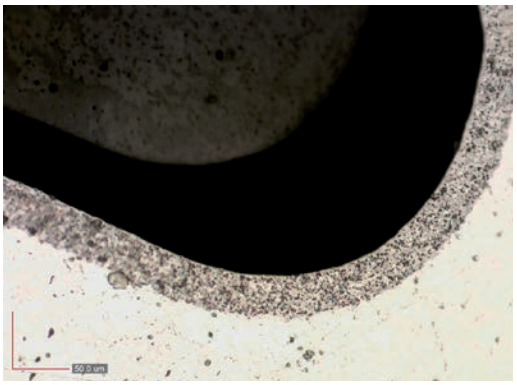
The hardness of a **DIA**PROTECT® coating can be adjusted to values between approx. 500 HV and 1,100 HV depending on the phosphorus content and after-treatment. This means that surfaces can be adapted to the respective type of load, e.g. different frictional stresses or different mechanical loads or chemical resistance.

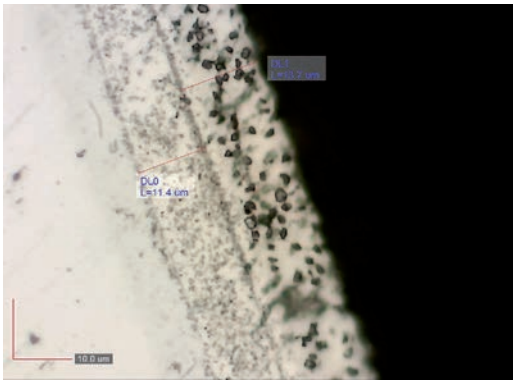
DIAPROTECT® achieves the highest wear resistance primarily through its dispersion coating design, in which diamond is predominantly used as embedded particles. The layers are deposited in thicknesses from about 10 µm to several hundred micrometres. In addition to the good wear resistance, DIAPROTECT® coatings are also characterised by a very high level of corrosion resistance, whereby excellent durability is achieved for many technical applications.

Typical applications for **DIA**PROTECT® coatings:

> Pump bodies and rotors in the chemical industry
> Highly stressed parts in the textile industry
> Components from oil and gas production and the chemical industry

Optimisation through combination: A combination coating with a thickness of up to 10 µm with **DIA**SHIELD® can reduce the surface roughness. This can be attributed to a substrate that is too rough or to the deposition of **DIA**PROTECT®-coatings with thicknesses significantly greater than 20 µm.





*Application examples of the **DIA**PROTECT®-system against strong abrasive and chemical wear combined with **DIA**SHIELD® as a running-in layer.*

CHARACTERISTIC VALUES FOR **DIA**PROTECT® COATINGS

The coatings for increasing wear resistance are available in variants with different compositions, different types of deposition and in combination with dispersion coatings with different types of dispersion materials. The type of coating to be used depends on the load at the place of use and can consist of both wear load and corrosion load.

Functional properties	Friction value-increasing diamond coating **DIA**PROTECT®		
Designation	**DIA**PROTECT®*NANO*	**DIA**PROTECT®*2D*	**DIA**PROTECT®*10D*
Average particle size	0,5 µm	2 µm	10 µm
Deposit rate Vol %	15 % bis 60 %	15 % bis 60 %	15 % bis 60 %
Layer material	Electroless nickel-phosphorus or electroplated nickel or nickel-phosphorus		
Hardness of coating matrix	550 – 1.100 HV0,1		
Layer thickness of the matrix (electroless nickel)	10 - 300 µm	10 - 300 µm	10 - 300 µm
Layer thickness of the matrix (electroplated nickel)	up to several hundred microns		

The thickness of the nickel layer is chosen so that the particles (e.g. diamond) are homogeneously incorporated into the layer.

A characteristic value of the coating is provided by the electroless nickel coating (as far as it is used for the coating) with phosphorus contents between 2 % and up to 13 %, available in three state forms:

> **Low phosphorus content** – 2 % to 5 % / high deposition hardness / lower corrosion resistance
> **Medium phosphorus content** – 5 % to 10 % / medium deposition hardness / higher corrosion resistance
> **High phosphorus content** – 10 % to 13 % / lower separation hardness / high corrosion resistance

The phosphorus content determines the basic hardness of the nickel layer, the achievable maximum hardness with the application of a temperature treatment and the corrosion resistance.

PREREQUISITES FOR WEAR-INCREASING COATINGS

The property of increasing the wear resistance of a surface is linked to certain design prerequisites:

> **Suitability for electroplating** – the substrate material must be suitable for electroplating, which is primarily reflected by very good adhesion of the coating to the substrate. The suitability for galvanic coating with **DIA**PROTECT® must be clarified in advance with the client.
> **Sufficient load-bearing capacity of the substrate** – the substrate must have sufficient load-bearing capacity to prevent excessive deformation with the associated collapse of the coating.
> **Hardness of the surface of the contact surfaces** – when using a **DIA**PROTECT® dispersion coating, the interlocking between the hard materials (e.g. diamond) of the dispersion coating (usually a nickel or nickel-phosphorus layer) and the surface of the component is determined by the surface hardness of the component. A higher surface hardness makes it more difficult for the diamonds to penetrate the component surface. A low surface hardness increases the shearing (in the form of material wear) of the material of the component due to (friction) wear.

If you have any questions or would like to place an order, please contact us at: T +49 (0)711 - 907 346 - 0
info@cct-plating.com
www.cct-plating.com