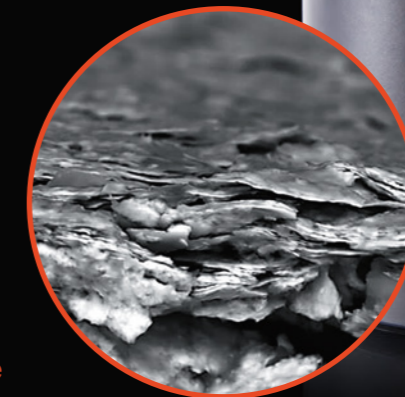
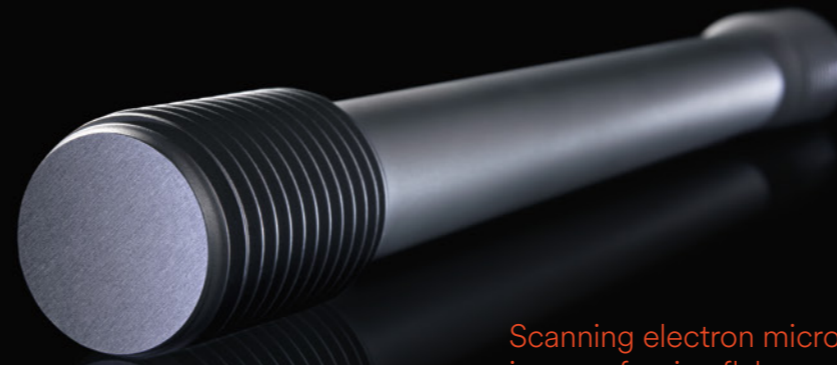


## Zinc Flake Systems from Dörken

Superbly thin high-performance protection





Scanning electron microscope image of a zinc flake coating

## EXTREMELY LOW COATING THICKNESS AND HIGH DURABILITY

With high-performance zinc flake systems, Dörken offers surface protection with excellent long-term effectiveness, tried and tested over many years in a wide range of sectors and applications. The special advantage: this is achieved with an extremely thin coating – a system consisting of base- and topcoat with a thickness of just 8-20µm protects steel parts for over 1,000 hours against base metal corrosion (red rust) in the salt spray test according to DIN EN ISO 9227.

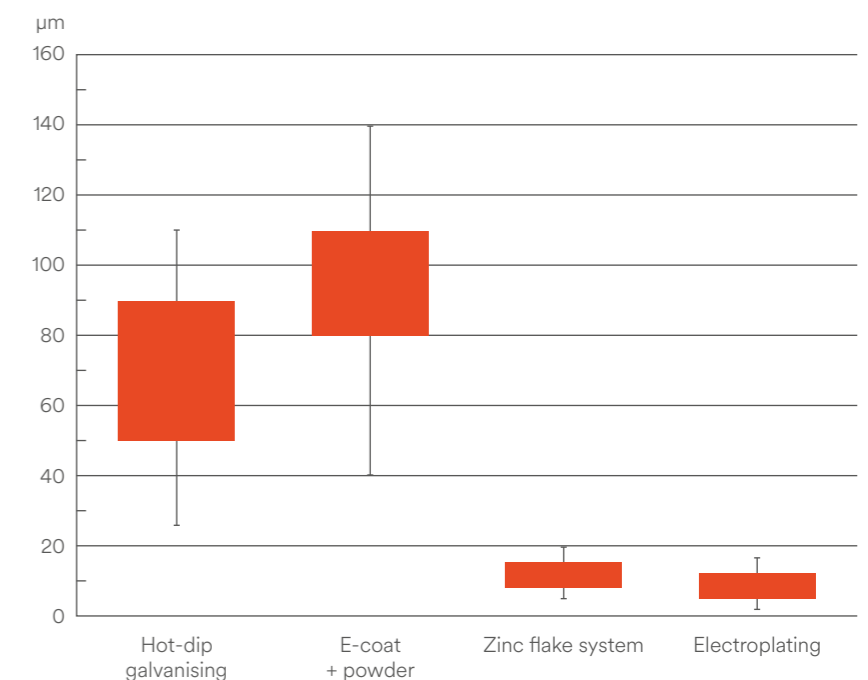
### COMPLEX GEOMETRIES AND HIGH TENSILE STEELS

With their high-performance capacity combined with minimal coat thickness, zinc flake coatings are used most widely for screws and fastener technology in the automotive sector – but Dörken systems also have an impressive record in the coating of large construction parts of complex geometry. Furthermore, the superbly thin protective film is attractive from an ecological and economical point of view owing to its low resource input. A further advantage: As no hydrogen is produced during the coating process, there is no risk of application-related, hydrogen embrittlement. Zinc flake coatings are therefore particularly well suited for high tensile steels (> 1000 MPa).

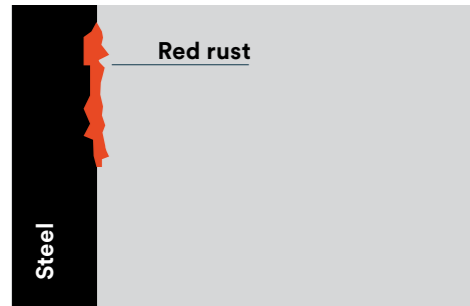
### WHAT IS A ZINC FLAKE COATING?

The coating is a metallic „lacquer“ consisting of numerous small flakes (as per DIN EN ISO 10683 or DIN EN 13858), bound together through an inorganic matrix and providing active cathodic corrosion protection.

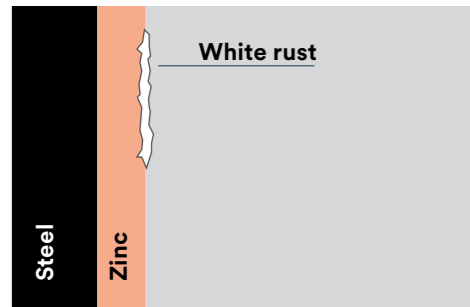
Typical coating thicknesses of various coating systems



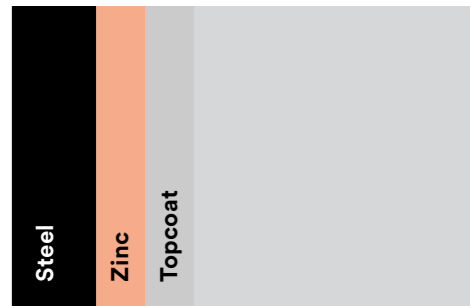
# OUR APPROACH IN DETAIL: CATHODIC CORROSION PROTECTION



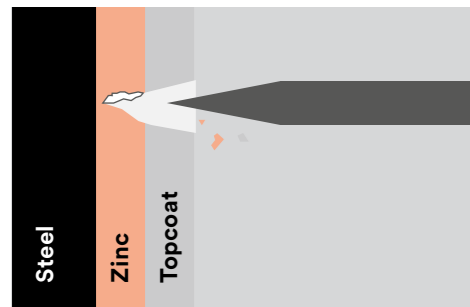
In the unprotected state, environmental influences cause rapid corrosion of iron. After further oxidation and dehydrating reactions, the products of corrosion are visibly deposited as red rust.



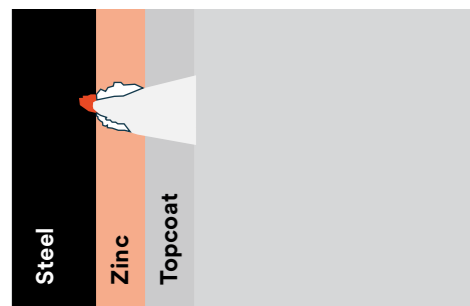
When the surface of the steel is coated with a zinc flake system, the zinc corrodes first, thus protecting the underlying base metal. Zinc hydroxide is deposited in the process as visible white rust.



A further sealing layer (topcoat) reinforces the corrosion protection by hindering the deterioration of the zinc and iron. Corrosive media (water, salt, chemicals) are kept away from the surface.



The corrosion protection will even withstand mechanical surface damage such as scratches or stone impact. The less noble zinc deteriorates more rapidly in place of the nobler iron. This is referred to as active cathodic corrosion protection.



The base metal will not begin to corrode (red rust) until the zinc around the area of damage has sacrificed and its barrier action is no longer sufficient.

## Zinc flake diversity

Duration of salt spray test (without red rust)	Reference layer thickness of the coating system*
> 600 h	6 µm
> 720 h	8 µm
> 960 h	10 µm

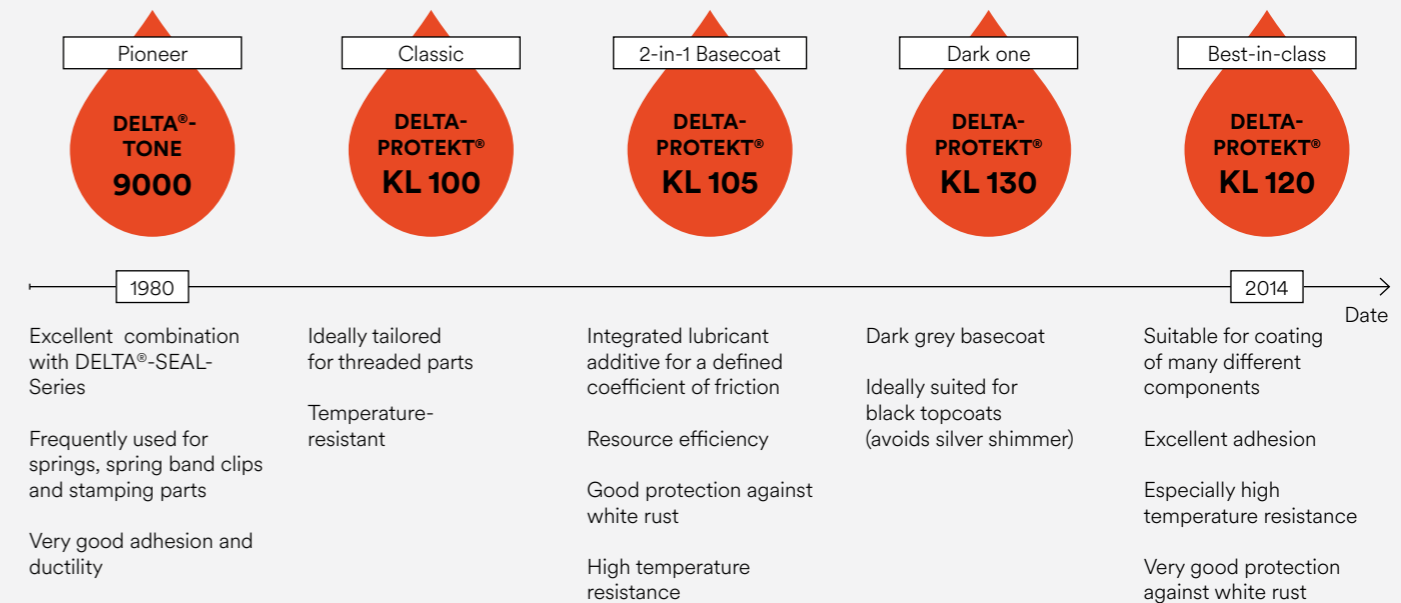
\*The reference layer thickness includes both base- and topcoat – depending on the composition of the coating system

A coating system generally comprises a basecoat and a topcoat. Several layers can be applied to the surface in question, depending on the specified requirements.

Relation of layer thickness to salt spray resistance as per DIN EN ISO 10683

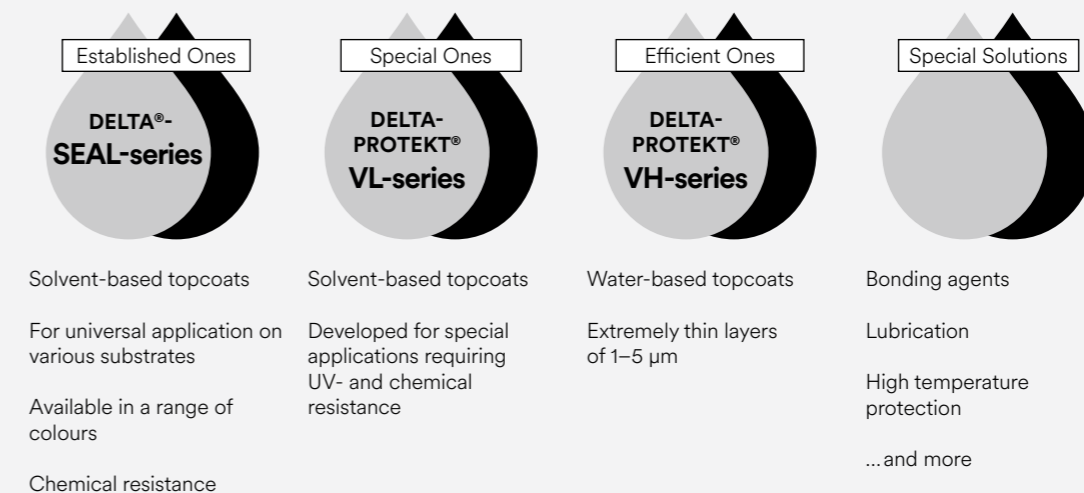
### Zinc flake basecoats

The basecoat is the layer chiefly responsible for cathodic corrosion protection.



### Zinc flake topcoats

The various topcoats act as a further layer of corrosion protection and are responsible for **additional properties such as the coefficient of friction and chemical resistance.**



# APPLICATION PROCESS: Step by step towards optimal corrosion protection

## PRETREATMENT

Components must be free of rust and scale, dirt and dust, oil and grease, and should be dry before coating. Typical pretreatments are hot alkaline degreasing, blasting with various abrasives (e.g. with stainless-steel or steel shot) or chemical pretreatments such as phosphating or pickling. For zinc flake coating we hot alkaline degreasing followed by shot blasting. Special blasting additives can be used to improve the blasting process. These ensure that the blasting material remains clean (free of oil), thereby allowing longer periods of use.

## COATING

Zinc flake systems are applied in a series of similar coating steps.

First, a zinc-aluminium basecoat is applied and predried. This is then cured in an oven at a product-dependent temperature (usually 180 °C), which gives the coating its protective function.

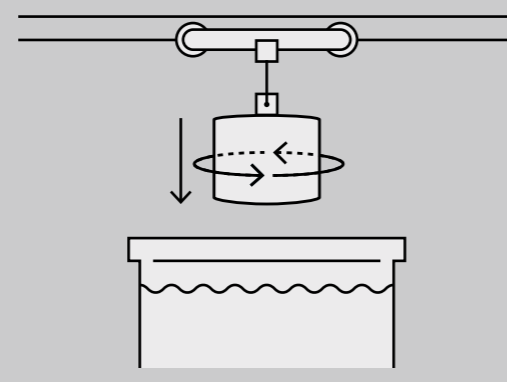
The topcoat layer is applied by a similar procedure, with individual specifications for temperatures to be used for curing and drying.

Depending on the type of components there are different coating processes.

## DIP-SPIN PROCESSES

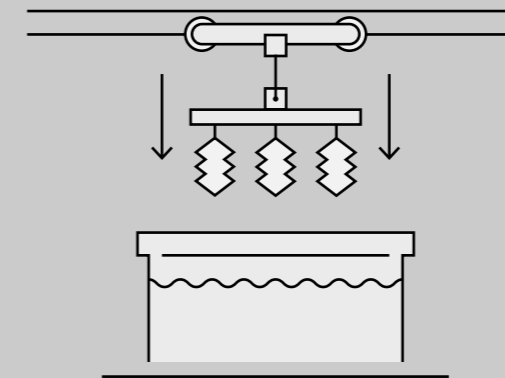
For small parts to be coated in bulk, the dip-spin technique is the best option. Mesh baskets of varying size are used depending on the number, geometry and volume of the bulk parts. These are dipped in a coating container with coating material and then pulled out spun at a defined speed, so as to obtain the desired coating thickness – even for parts of complex geometry.

Apart from the dip-spin process for bulk products, the same technology can be used for racked parts. These larger components are fixed for the coating process to prevent the heavy parts from damaging each other.



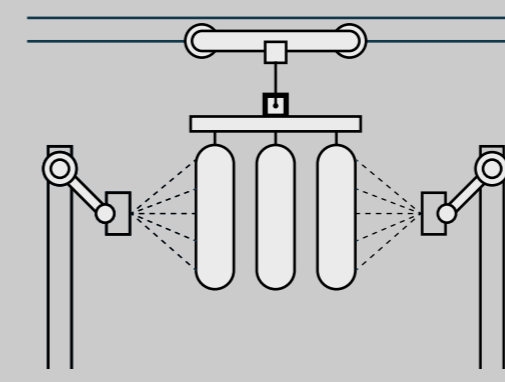
## DIP-DRAIN PROCESS

The dip-drain process is designed for large components where the specified coating thickness is attained by a defined drawing speed and viscosity of the coating material.



## SPRAY PROCESS

For large components, the alternative process of spraying is commonly used. This can be done manually or by robot. The procedure is particularly useful where partial coating is required. Different spray technologies are applicable. Electrostatic spray guns reduce overspray and increase process efficiency.



## CURING

Both the zinc flake basecoats and their matching organic topcoats must be cured so that they bond. Depending on the product, inorganic topcoats are also cured or forced-dried. The following types of ovens can be used for all products: continuous conveyor oven, rack oven or chamber oven. Inductive- and infrared drying are also increasingly employed.



More information:  
[www.doerken.com](http://www.doerken.com)

# DÖRKEN ZINC FLAKE SYSTEMS:

## Diverse components for every market



### LEAF SPRINGS

- Ductility
- Stone impact resistance
- Low curing temperature

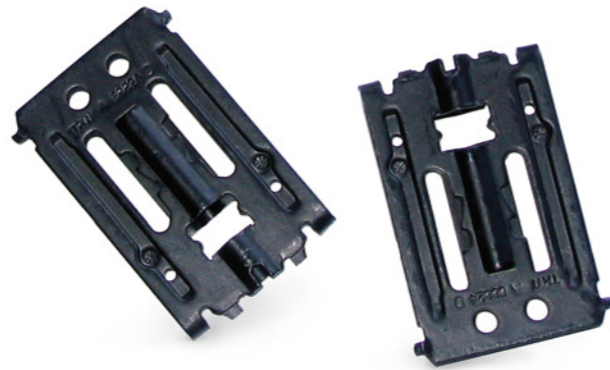


### SPRINGS

- Ductility
- Good adhesion
- Low curing temperatures

### STAMPING PARTS

- Optically attractive surfaces
- Sliding properties



### THREADED PARTS

- (HSFG screw/bolt/washer set)
- Defined coefficient of friction
  - Trueness to gauge
  - Assembly properties



### LARGE COMPONENTS

- (Subframe, Axle Components, Triangular Control Arms)
- Stone impact resistance
  - Chemical resistance
  - UV-resistance



### SPRING BAND CLIPS

- Ductility
- Bondability
- Media resistance

### DÖRKEN ZINC FLAKE SYSTEMS: PROPERTIES AT A GLANCE

- High cathodic corrosion protection
- Balanced system of base- and topcoat
- Extremely thin coating of 8–20 µm
- Seamless coating of threaded parts
- Low curing temperatures (up to max. 240°C)
- No application-related hydrogen embrittlement
- Attractive appearance through coloured topcoats
- Adjustment of coefficient of friction and assembly properties
- High chemical resistance
- Chrome(VI)-free and resource efficient

# A partner for success. Right from the start.

Corrosion Experts – at Dörken this is every single employee with his or her personality and know-how. There for you worldwide.

From the beginning to series production:



## ESTABLISHING CONTACT

Whether in person, by telephone or e-mail – we will be happy to discuss the requirements of your project and further procedures with you. A direct line is of particular value to us and is standard in our daily work - quick, simple and direct.



## STATUS QUO ANALYSIS

An individually assembled team investigates your concerns and needs in detail. Together with you, the goals are defined and the best solution for your individual project is determined. We then work out a detailed schedule.



## SURFACE DETERMINATION & PLANT PLANNING

Each component requires a detailed analysis in order to obtain the best possible overview of the general conditions of your project. In addition to the sampling service and customer-specific tests, finding and deciding on a suitable interface also includes support in choosing the appropriate application technology. Together, we will make your project a success.



## ON-SITE IMPLEMENTATION

Dörken accompanies you in all phases of your project. From conception to the commissioning of your coating plant, our specialists are there for you to guarantee an ideal process. Regular audits ensure the quality of your plant and coatings and optimize them sustainably.



## KNOWLEDGE TRANSFER

As an active partner, Dörken is also available to assist you with any questions you may have. The Dörken Academy offers target group-oriented knowledge transfer and project-oriented solutions – individually tailored to your needs.



## GO-TO-MARKET

You can rely on us even after the successful completion of your project. Accompanying PR events, joint trade fair appearances or approval at the OEM – a small selection of our extensive portfolio in the area of after-sales service.

**Discover  
expertise**



**Dörken Coatings GmbH & Co. KG**

Wetterstraße 58

58313 Herdecke

Germany

Telephone 0049 2330 63-243

Fax 0049 2330 63-354

E-Mail [coatings@doerken.de](mailto:coatings@doerken.de)

[www.doerken.com](http://www.doerken.com)

