



PROTEK® COATINGS

**PROTECTION AND PERFECT FUNCTIONS  
FOR ENHANCED PRODUCTIVITY**

## ADDED VALUE FOR ROLLS AND CYLINDERS:

**INTELLIGENT, FUNCTIONAL COATINGS**

The use of rolls made of steel, aluminium or composite materials in high-performance machines puts extremely high demands on surfaces. INOMETA develops and manufactures tailor-made coatings for various industrial applications. As needed, materials such as ceramics, metal, tungsten carbide or high-performance plastics are applied in controlled processes. In this way, we develop coating solutions for individual needs with maximum flexibility.

Durable anti-adhesion properties, electrical or thermal insulation and/or conductivity, traction or sliding properties as well as corrosion and wear resistance are features that ensure your processes and continuously improve and thus reduce your production costs significantly.

Our exemplary development skills in coating processes with advanced composites (CFRP/GFRP) create new industrial standards which ensure that our customers have a constant competitive advantage.

## THIS BROCHURE PROVIDES INFORMATION ON THE FOLLOWING SUBJECTS:

PROTEK® Coatings .....	4
Technology, Processes, Advantages and Applications at a Glance .....	5
Processes .....	6
Materials .....	7
Applications – Film Industry .....	8
Applications – Converting Industry .....	9
Applications – Printing Industry .....	10
Applications – Paper Industry .....	11
Characteristics .....	12
Products and Services .....	13
Surface Specifications .....	14



MULTIFACETED AND RELIABLE

## COATINGS FOR EVERY REQUIREMENT

PROTEK® coatings sustainably enhance quality, thus creating noticeable production advantages. They are specifically tailored for rotationally symmetrical components such as rolls and cylinders which are used in the production of film, paper, cardboard and textiles. In addition, surfaces with PROTEK® coatings are used in the production of self-adhesive products and in printing technology.



As a DIN ISO certified company, we deliver consistent quality for maximum customer benefit.



INOMETA is dedicated to continuous product and process innovation so that our customers can maintain their technological and economic edge.

### Technology & Processes

At INOMETA, thermal spraying technology is used for the coating process. This technology is superior to other coating methods, as it can be used for a variety of materials. Depending on the application, layers of metal, carbide or ceramics, as well as combinations with plastic can be applied and adapted to individual requirements.

In addition, INOMETA has developed a casting and winding method for stress-free application of composite coatings. The rapid development in the field of thermoplastics and thermosets opens up new material selection possibilities. Diffusion-tight coatings with high chemical resistance and high toughness are just one example of the many possibilities. The addition of ceramic fillers or other wear-resistant fillers makes for composite coatings with excellent abrasion resistance.

### Productivity & Profitability

Investments must make sense from an economic point of view. Thus, the economic benefit of a technical solution comes first for INOMETA. The use of PROTEK® coatings helps increase the performance of machinery and equipment as well as ensure product quality.

### About the Company

INOMETA is a market leader in the development, production and distribution of web guiding, sensor and functional rolls, printing sleeves and adapters, technical tubes and functional surfaces. Our main focus is lightweight design, using aluminium and carbon fiber composite materials to increase productivity and the associated added value.

### Customer Benefits

- extended roll service life
- higher speed of production
- minimization of machinery downtime
- easement of surface cleaning
- improved product quality

### Application Scenarios

Examples of components, the technical and economic characteristics of which we can optimize through coatings, are as follows:

- stretch rolls
- coating rolls
- web guide rolls
- crush cutter shafts
- fold and draw rolls
- carrier rolls
- film rolls & dampening rolls
- anilox rolls
- treatment rolls
- friction wheels
- godets
- inspection rolls
- calender rolls

This list is a selection. For more application examples, do not hesitate to ask us.



## THERMAL COATING FUNDAMENTALS

# PROCESS

**INOMETA has moved ahead in the development of thermal spraying parameters to provide an optimum protection against static, dynamic, mechanical and chemical stresses for various components. With this method, a variety of combinations of base materials and coating materials is possible. In essence, we have four differing applications that we use to resolve different requirements.**

### Thermal Spraying with Wire or with Powder

Thermal spraying uses a flame of fuel gas and oxygen to fuse and/or melt the spray materials before spraying it onto the workpiece surface with the help of expanding combustion gases.

### High Velocity Oxygen Fuel Spraying (HVOF)

High velocity oxygen fuel spraying mixes fuel gas and oxygen in a combustion chamber where a constant high pressure ensures that the resulting combustion is stable and uniform. The constant high pressure of the fuel-gas/oxygen-mixture propels a gas jet with a spray material out of the subsequent expansion nozzle at supersonic velocity. Upon

impact on the substrate, the very high kinetic energy release makes for excellent adhesion and very low porosity of the coating. As the spray material is not subjected to high temperatures, strong metallurgical changes need not be expected.

### Atmospheric Plasma Spraying (APS)

In atmospheric plasma spraying, a high-powered arc and a gas (e. g. argon, helium, nitrogen, hydrogen, or a mixture of these) are used to create a plasma beam that melts a spray material which is most often introduced as a powder. Depending on the desired heat deposition rate, the spray material can be intro-

duced internally or externally. Special nozzle configurations allow for similar particle velocities as generated in high velocity oxygen fuel spraying.

### Arc Spraying

In arc spraying, two metal wires are molten in a high powered electric arc. The molten droplet is atomized e. g. with compressed arc and projected onto the prepared workpiece surface. The use of nitrogen or argon as atomizing gas can significantly reduce the coating oxidation.

## SPECIFICALLY TAILORED FOR THE APPLICATION

# MATERIALS

### Increasing Production Capacity while Reducing Machinery Downtime

#### PROTEK® Hard Metal Coating made of Tungsten Carbide or Chromium Carbide

These extremely hard, dense, adhesive coatings offer a high degree of wear protection. They are resistant against erosion and abrasion and can withstand impact and shock loads. They are mostly used in the paper and cardboard manufacturing industry as well as in film production and finishing industries.

#### PROTEK® Metal Coating

Metal coatings with high surface quality on cylinders made of CFRP/GFRP are an important building block for the use of lightweight rolls in high-performance machines. In addition, PROTEK® metal coatings can be used to increase an external diameter, as repair coating for fitting surfaces or as corrosion and wear protection coating.

#### PROTEK® Polymer Coating

Special polymers or fluoropolymers, protected by metal, ceramic or hard metal spray coatings are extremely wear-resistant functional surfaces. They have special, durable non-stick, transport or sliding properties. As an example, PROTEK® non-stick coating can be used on production rolls for hygiene and self-adhesive products as well as in the printing, film, paper and cardboard manufacturing industries.

#### PROTEK® Ceramic Coating

A ceramic coating made of titanium, aluminum and chromium oxides is resistant against friction and sliding abrasion. It will also provide wear protection to guide units for films, fibers, paper and cardboard. Defined surface structures ensure entrainment and air exhaustion. Ground coatings have excellent sliding properties. Depending on the stage of processing, hydrophilic or hydrophobic properties can be created.

#### PROTEK® Composite Coating

High performance coatings that have an excellent tensile adhesive strength on CFRP and GFRP are very tough and highly resistant against chemicals. In connection with solids, this means perfect abrasion resistance. Electrical insulation or conductivity are adjustable. The composite coating can be used both as an operating wear protection and as a specified layer for re-rubbing.





## SOLUTIONS FOR CALENDER, CAST, BLOWN AND BIAXIALLY STRETCHED FILM PRODUCTION

# APPLICATIONS – FILM INDUSTRY

### Film Production

Highly abrasion-resistant surface coatings with very little porosity and excellent surface gloss are needed for film forming. Short heating phases as well as scratch, cut and shock resistance are significant prerequisites of high-performance surfaces.

**Example rolls: calender rolls, chill roll**

### Web Guiding

The use of PROTEK® coatings which are specially adapted to the application effectively prevent adherence of various substances such as glue, plasticizers and contaminants.

Especially for fast running machines, it is possible to achieve additional air dissipation by specifically modifying the surface structure. This effectively reduces airplaning effects. Cut-resistant PROTEK® coatings prevent burrs caused by the use of cutters on the rolls. Clean, scratch-free operation requires very good traction properties, especially with low wrap angles or draw rolls. A conductive surface is required to dissipate static charges from the product.

**Example rolls: guide rolls, draw rolls, cutting rolls, suction rolls, web edge control rolls and tension measuring rolls, contact rolls and winding cores**

### Surface Treatment/Inspection

Surface treatment such as corona treatment requires highly abrasion-resistant ceramic coatings with excellent corrosion resistance and electrical insulation. In particular, having sufficient dielectric strength is a special challenge for the surface. A light absorbing and permanently homogeneous color scheme is required for optical inspection systems that detect surface blemishes.

**Example rolls: functional rolls, inspection rolls**

## WEB FINISHING AND PACKING SOLUTIONS

# APPLICATIONS – CONVERTING INDUSTRY

### Applying/Coating

Special precision and lasting dimensional stability are required in the domain of coating and/or laminating units. Hydrophilic/hydrophobic surface properties can make significant contributions to your process optimization. PROTEK® ceramic or hard metal coatings offer highest functionality.

**Example rolls: coating rolls, coating cylinder, laminating roll**

### Web Guiding

The use of wear resistant PROTEK® non-stick coatings effectively prevent adherence of various substances such as glue, paste, hot-melt adhesive, dust or any other contaminant. By specifically modifying the surface structure and introducing polymer or fluoropolymer, traction and non-stick properties as well

as wear resistance can be regulated, or even increased. Web guiding can be significantly improved with PROTEK® non-stick traction coatings without causing scratches to the substrate. If necessary, the surfaces can be made to be cut resistant.

**Example rolls: guide rolls, draw rolls, suction rolls**

### Surface Treatment

Surface treatment such as corona treatment requires highly abrasion-resistant ceramic coatings with excellent corrosion resistance and electrical insulation. In particular, having sufficient dielectric strength is a special challenge for the surface. A light absorbing and permanently homogeneous color scheme is required for optical inspection systems that detect surface blemishes. Excellent corro-

sion resistance is especially called for due to waste products generated within the process.

**Example rolls: treatment rolls, inspection rolls**

### Cutting and Winding Technology

An excellent web guiding and tension separation system is of utmost importance for a successful edge trimming process. PROTEK® traction coating ensures that the substrate remains flat on the rolls for a clean cut. To significantly increase the service life of lower cutter shafts, INOMETA has developed an extremely resistant hard metal coating.

**Example rolls: draw rolls, guide rolls, cutter and contact rolls as well as winding cores**





## SOLUTIONS FOR GRAVURE, OFFSET AND FLEXOGRAPHIC PRINTING

# APPLICATIONS – PRINTING INDUSTRY

### Web Guiding

Over lengthy periods, special PROTEK® coatings effectively prevent the adherence of various substances such as ink, paste, dispersions and contaminants. Especially with low wrap angle or draw rolls, very good traction properties are required to reduce differential speeds and prevent paper jams.

With tailor-made PROTEK® coatings, web guiding properties can be enhanced to a point where airplaning effects are permanently and effectively reduced.

**Example rolls:** guide rolls, web edge control rolls, draw rolls, guide spindles, fold rolls, cutting rolls

### Printing Unit

PROTEK® coatings can be either conductive, or thermally and electrically insulating. Because the wear-resistant ceramic coatings come with adjustable surface energies (e. g. hydrophilic or hydrophobic), different water / ink handling and dosage functions are possible. The coating is made of high-quality Rilsan® polyamides which are applied free of pores. The highest precision during application and treatment of the coating ensure best print results.

**Example rolls:** dampening rolls, bridging rolls and doctor rolls, functional rolls, applicator rolls, anilox rolls, film rolls, printing rolls, impression rolls

## COATING SOLUTIONS FOR ALL PAPER INDUSTRY SECTORS

# APPLICATIONS – PAPER INDUSTRY

### Paper Guide Rolls

For CFRP guide rolls installed in paper machines, INOMETA offers special composite coatings with very good wear and chemical resistance characteristics. For the user, Flexocoat V170 and V12 plus mean a considerable increase in service life when compared to rubber-coated rolls.

Another alternative is the proven PROTEK® non-stick coating which is used when bitumen, stickies, latices or similar substances escape, and using doctor blades is not possible for technical reasons.

But when it comes to extreme wear resistance, dimensional stability and high degree of hardness, PROTEK® hard metal coatings are the obvious choice. This coating has hardness of up to 1,450 Hv, a surface roughness of Ra 0.03 µm, and is resistant against friction and sliding abrasion. Therefore doctor blades can be used without problems.

### Dryer Felt Rolls

PROTEK® non-stick coatings have proven to be best suited for dryer felt rolls, offering excellent anti-adhesion, corrosion resistance and traction properties. PROTEK® ceramic coatings can be particularly recommended if a doctor blade is to be used.

### Calender Rolls

For calender rolls, INOMETA offers the specially developed PROTEK® hard metal coatings, which have the distinction of a very high degree of wear resistance, hardness and a very low degree of roughness (Ra < 0.03 µm).

### Reel Drums

Ideally, features required for reel drums such as wear resistance, impact strength and traction are provided with proven PROTEK® hard metal coatings.

### Spreader Rolls

INOMETA offers various coatings for a wide range of applications. The solutions range from non-stick coatings for coating machines to hard metal coatings for excellent traction to extremely wear-resistant ceramic coatings.





A CORNUCOPIA OF FUNCTIONS THAT WILL LEAVE YOU FAVORABLY IMPRESSED

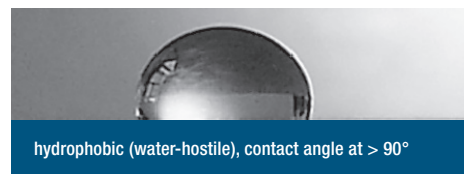
# CHARACTERISTICS

### Non-Stick Properties

Precisely adjusted hydrophilic/hydrophobic properties provide extremely durable function surfaces, especially in conjunction with very abrasion-resistant surface coatings. With the help of additional micro- and/or nano-structures, very strong anti-adhesion properties can be achieved which can be of advantage in areas where sticky substances are manufactured and processed.



hydrophilic (water-friendly), contact angle towards 0°



hydrophobic (water-hostile), contact angle at > 90°

### Thermal Insulation

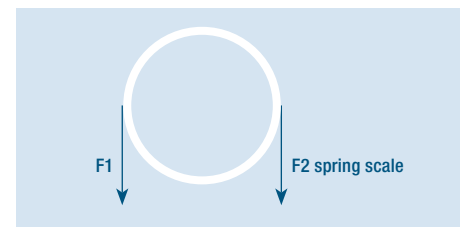
Electrical or thermal insulation and/or conductivity are properties that are required for example for corona surface treatment of films and paper. PROTEK® surfaces achieve dielectric strengths of > 30 kV. Thermal insulation coatings can e.g. be used in conveyer furnaces. High-performance thermal barrier coatings have a thermal resistance value of up to 1 Wm/K.

### Adjustments

Protection against corrosion, abrasion and erosion. PROTEK® surfaces can be adapted to precisely meet various industrial requirements such as hardness, adhesion, cohesion and porosity.

### Traction or sliding

These properties can be specifically adjusted. The aim is e.g. to have prevent slippage, air intake or wrinkling of the web. The Euler Eytelwein formula is used to determine the friction value. Here, the static friction properties between substrate and roll surface are determined with the help of a defined angle of contact.



## WITH EXPERIENCE AND COMMITMENT

# PRODUCTS AND SERVICES

INOMETA is dedicated to continuous product and process innovation so that our customers can maintain their technological and economic edge. We develop and manufacture tailor-made coatings for industrial applications.

### Inspection, Recoating and Repair

- Our services cover all work from regular inspections to coating and repair:
- coatings can be applied to components with dimensions of up to 2 m diameter, 17 m length and 20 t weight
  - application-oriented and precise choice of coating
  - recoating procedures on high-performance-/roll coating equipment
  - mechanical machining such as turning, grinding, brushing, lapping and polishing
  - dynamic balancing acc. to VDI 2060, ISO 1940
  - damaged journal inspection and refurbishing of damaged bearing seats
  - customer-oriented coating development

- environmentally responsible disposal of old coating material
- development of individual, customer-friendly service plans

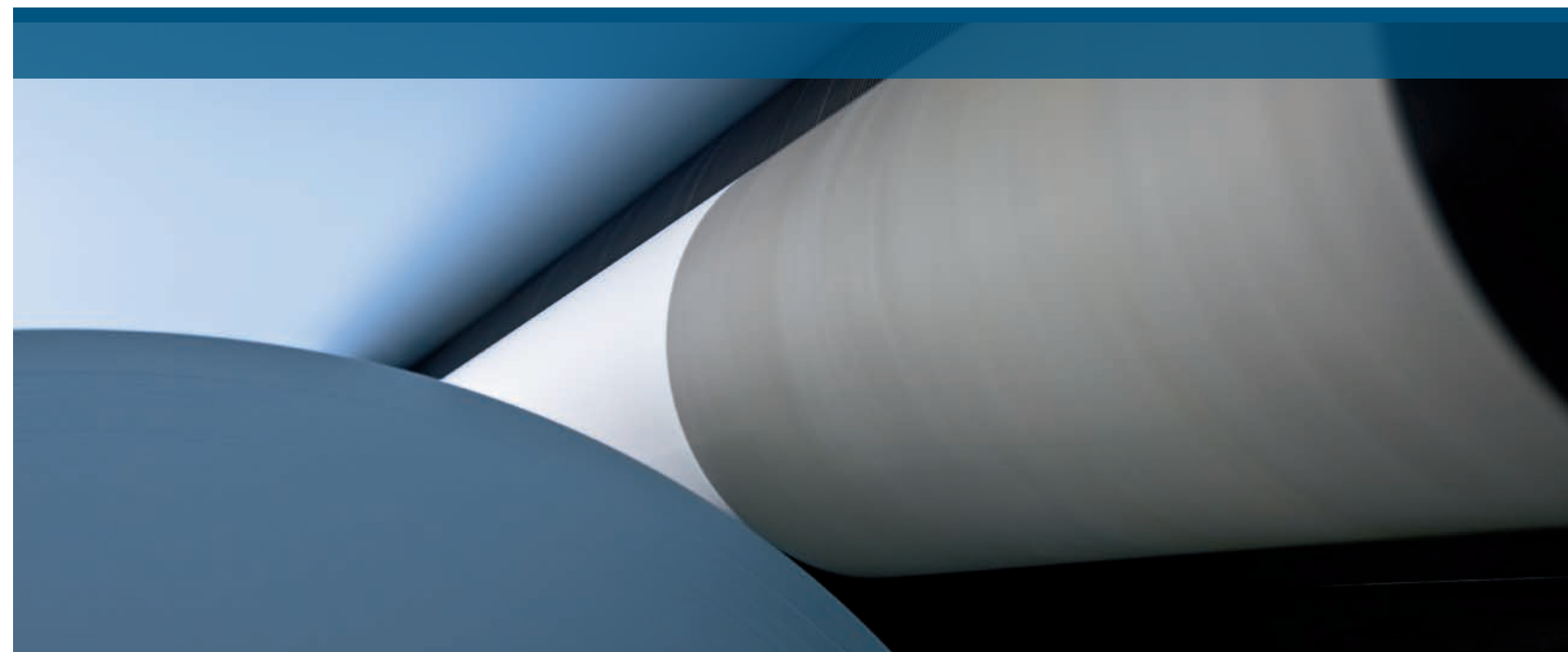
### Roll Service

- Our services are offered for guide rolls, functional rolls, calender rolls and spreader rolls of all manufacturers represented on the market. This has the following convincing advantages for you as our customer:
- greatest possible reliability through exclusive use of spare parts made by renowned manufacturers
  - processing of steel, aluminium and composite materials with advanced manufacturing technology

### In addition, you will enjoy the outstanding expertise INOMETA can provide:

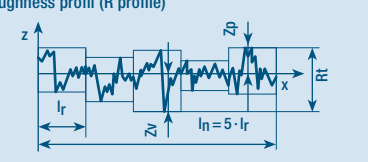
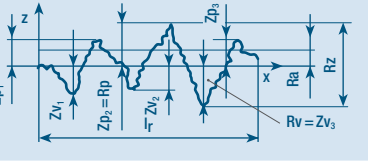
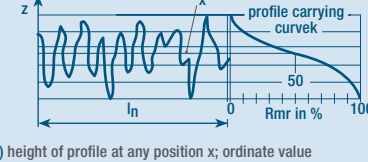
- over 250 experienced, highly motivated employees in management, development and production
- decades of experience in roll technology and roll coating for the most demanding applications
- years of experience in consulting, design and calculation of spreader rolls for the paper industry

High-performance lay-on roll made of CFRP with extremely wear-resistant PROTEK® hard metal coating.



ROUGHNESS DEPTHS AND SURFACE HARDNESSES

# SURFACE SPECIFICATIONS

SURFACE PROFILE	CORE SIZES	EXPLANATORY NOTES
 <p>roughness profil (R profile)</p>	total height of the profile Rt	The roughness profile is created through high pass filtering, i. e. through suppression of long-wave profile components. The total height of the profile Rt is the sum of the height of the largest profile peak Zp and the depth of the largest profile valley Zv within the evaluation length ln.
	Rp, Rv greatest height of profile Rz <sup>1</sup>	Height of largest profile peak Zp, depth of largest profile valley Zv within the sampling length lr. The greatest height of the profile Rz is the sum of the height of the largest profile peak Zp and the depth of the largest profile valley Zv within the sampling length lr.
 <p>Z(x) height of profile at any position x; ordinate value ln measurement line lr sampling length</p>	arithmetic mean value of the profile ordinate values Ra <sup>1</sup> material ratio of the profile Rmr centerline (x-axis) x	The arithmetic mean value of the profile ordinate values Ra is the arithmetic mean value of the amounts of all ordinate values Z(x) within a sampling length lr. The material ratio of the profile Rmr is calculated as the quotient of the sum of the load-bearing lengths of material in the prescribed cutting height and of the measurement line. The centerline (x-axis) x is the line which corresponds with the long-wave part of the profile which is suppressed by the profile filtering.

<sup>1</sup> According to DIN EN ISO 4288, the arithmetic mean of five sampling lengths is generally used for core size determination for core sizes which are defined via sampling length. Source: Book of Tables (Europa Lehrmittel)

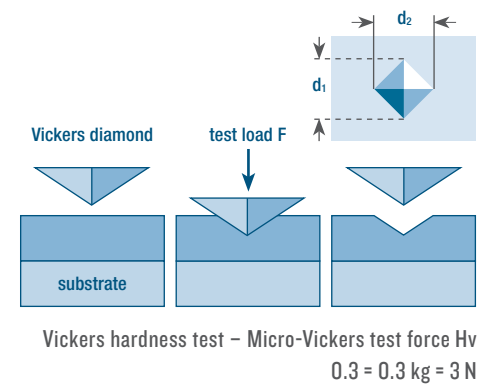
VICKERS HARDNESS HV10	ROCKWELL HARDNESS HRC	MATERIALS	POSSIBLE HARDNESS VALUES (HV0, 3)
400	41	metal	200 - 1,000
500	48		
600	55		
700	60		
800	64		
940	68	ceramics	700 - 1,300
1,000	-		
1,100	-	carbide	1,000 - 1,500
1,200	-		
1,300	-		
1,400	-	non-stick	200 - 1,500
1,500	-		

- DIN 50150 rounded to whole numbers

ROUGHNESS	RA VALUE	RZ VALUE
N1	0.006 – 0.025	0.25 – 0.4
N2	0.0251 – 0.05	0.41 – 0.63
N3	0.051 – 0.1	0.631 – 1
N4	0.11 – 0.2	1.1 – 1.6
N5	0.21 – 0.4	1.61 – 2.5
N6	0.41 – 0.8	2.51 – 4 (6.3)
N7	0.81 – 1.6	6.31 – 10
N8	1.61 – 3.2	10.1 – 25
N9	3.21 – 6.3	25.1 – 40
N10	6.31 – 12.5	40.1 – 63
N11	12.51 – 25	63.1 – 100
N12	25.1 – 50	100.1 – 160

~ following DIN ISO 1902

A layer optimized towards hardness will not automatically have the high wear resistance required for the application. For economic reasons, the surface topography and the related surface roughness will be adapted to meet customer requirements.





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