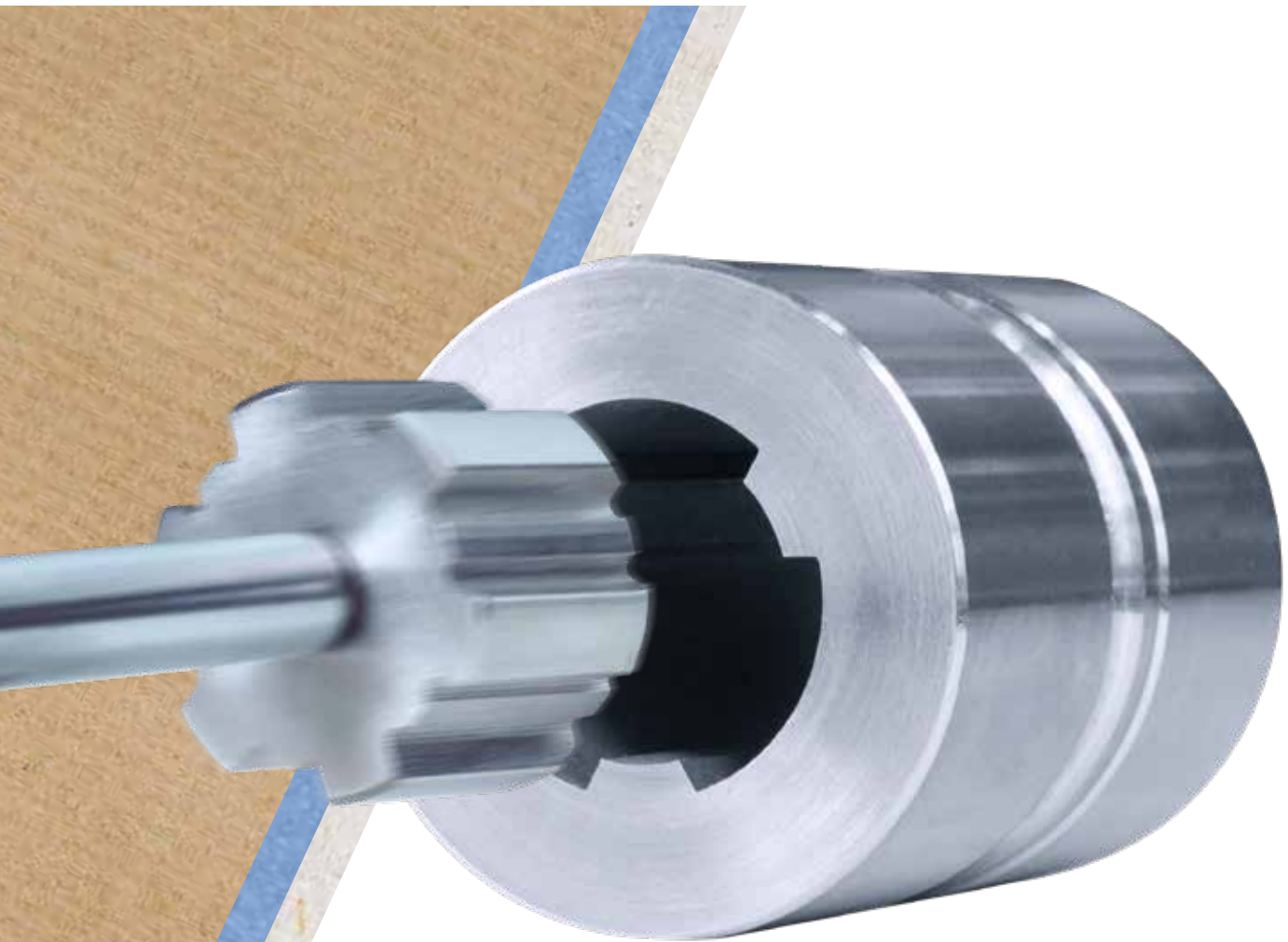
HORST SPRENGER

ON THE MOVE FOR THE PAPER INDUSTRY

ROD METERING SYSTEMS AND ASSEMBLIES



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TOGETHER ON A NEW WAVE OF SUCCESS

When rod metering systems come into operation in paper industrie, the name Horst Sprenger is often mentioned. In the past years and decades our metering rods and rod beds have set standards in quality, durability and reliability. Currently, improved surfaces further reduce material wear and thus allow a higher overall quality.

Now Horst Sprenger is even more efficient: As a new member of the IBS Paper Performance Group, we and our customers benefit from a strong background. However, our own competences will remain fully intact. The same applies to our orientation towards the future: We continuously look ahead, aiming to always achieve the best possible results for our customers. This allowed us to develop from a parts supplier to a system provider. This means concretely: In addition to our proven products, today we also offer solutions to optimize and modernize paper production or to align it to new production focuses.

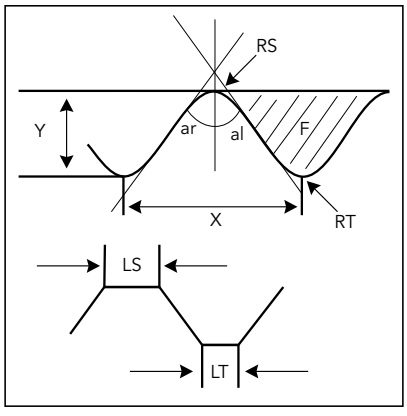
We concentrate on the needs of our customers and together we find ways to make production efficient and producers successful.

SMOOTH AND PROFILED

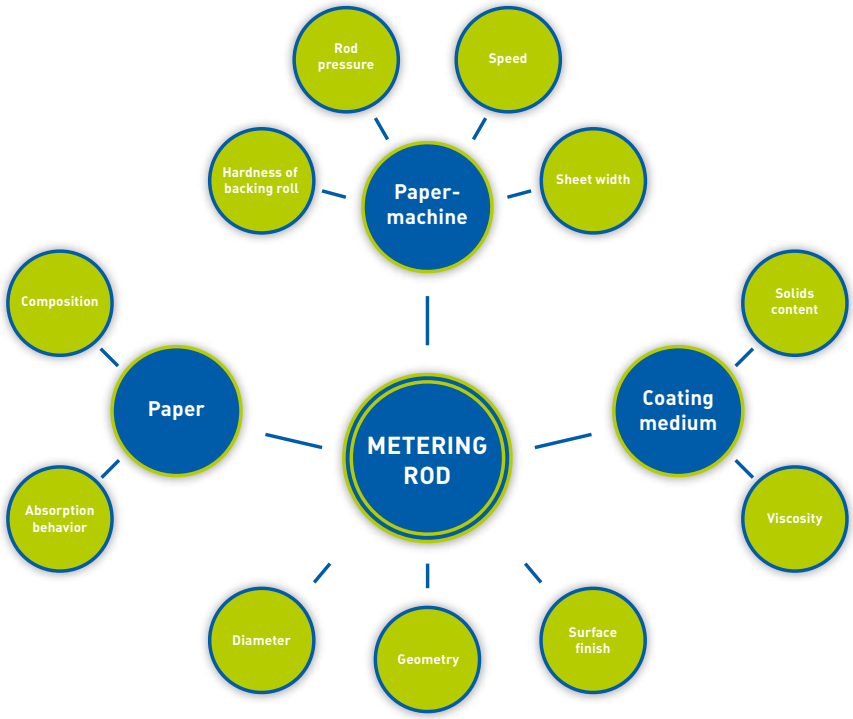
METERING RODS

Metering rods are precision tools. The production tolerances are within the µm range. During production, any deviation in diameter, smooth run, coating, etc. results in fluctuations in quantity and / or quality of the coating.

Horst Sprenger offers more than 50 different standard profiles (fine to coarse), thus allowing metering of virtually all possible coating volumes.



Importance of metering rod precision for coating volume
A deviation of only 1 µm in the depth of the profile, for instance, can lead to approx. 5% change in index or coating volume.



SMOOTH METERING RODS

HYDRODYNAMIC METERING

Metering with smooth rods – equivalent to metering with coater blades – is based on the hydrodynamic principle. The pressure in the dosing zone is of decisive importance for the coating volume.

This pressure is subject to the laws of fluid mechanics:

- Machine speed
- Geometry (diameter) of metering system
- Color rheology

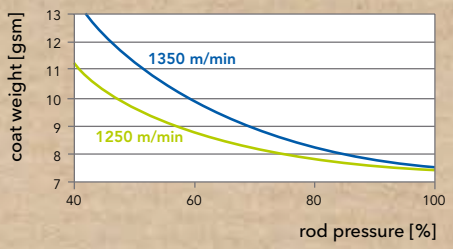
If the machine speed is increased by 100 m/min,
the coat weight may increase by nearly 10% from 8 g/m² to 8.8 g/m².

Larger diameters also lead to higher coat weights:
5 mm increase in diameter results in approx. 10% more coated film.

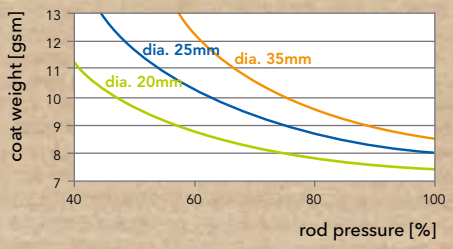
Usually the colour rheology or the solids content is the dominant value for the coat weight: A "relatively" small increase of solids content by approx. 3% can increase the coat weight by approx. 50%.

In practice, stable production conditions are only possible at comparatively high contact pressures. If the coating volume is increased by an insufficient contact pressure, fluctuations in the coat weight will occur.

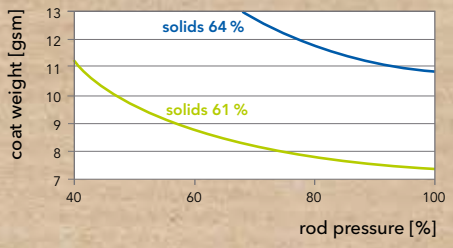
Example 1



Example 2



Example 3



All rod ends are available:

APPLICATION EXAMPLE FOR SMOOTH METERING RODS

Pre-coating of graphic papers with the filmpress

Smooth metering rods with diameters from 15 to 38 mm are preferred here. Smooth rod types have been particularly successful for high machine speeds and maximum solids content.

In practice, chrome-plated metering rods can reach service lives of approx. two weeks. With ceramic coated metering rods the service life can be up to more than four weeks.

Coating of cardboards, folding boxboard, bottle caarier board and liners

Smooth metering rods with 10 and 12 mm diameters have been used for decades, usually for pre-coating and back-side coating. Due to the distinct edge wear, the respective metering rods often have an extra strong chromium layer or ceramic coating.

PROFILED METERING RODS
VOLUMETRIC METERING

Metering with profiled rods is referred to as volumetric metering. During the metering process, the points of the profile are almost touching the sheet or applicator roll. The precise coating volume is determined by the geometry of the profile, i.e. by the rod profile cross section and distance.

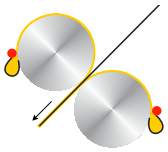
The design of the profile also affects quality of coating and service life. Based on our experience, the profile can be optimized for every application. We offer profiles for a metering range of 3 - 150 ml/m - thus also for the most common metering of 15 - 50 ml/m.

On profiled metering rods, the linear load serves more as wear compensation than for setting of coating volume. Ideally, directly after the installation of a new metering system a high contact pressure is applied, which is continuously reduced until the minimum pressure is reached. This ensures a consistent coating volume at maximum service life of the metering system.

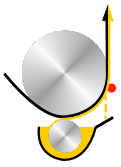
Our test series, laboratory evaluations, and decades of practical experience enable our customers to optimize their application processes in a targeted manner:

- Increased coating evenness = increased quality
- Longer service life = increased economic efficiency
- More intelligent design = new possibilities for innovative paper products

APPLICATION EXAMPLE FOR PROFILED RODS



Surface sizing with the filmpress
This is certainly the most important application for the profiled, chrome plated metering rod with a diameter of 10 to 15 mm. In contrast to the smooth metering rod, the profiled rod can be used in an extremely wide range of viscosity, making it ideal for very low viscosity starches. In 24/7 operation, a rod life of up to four weeks can be easily achieved if the starch is largely free from abrasive components.



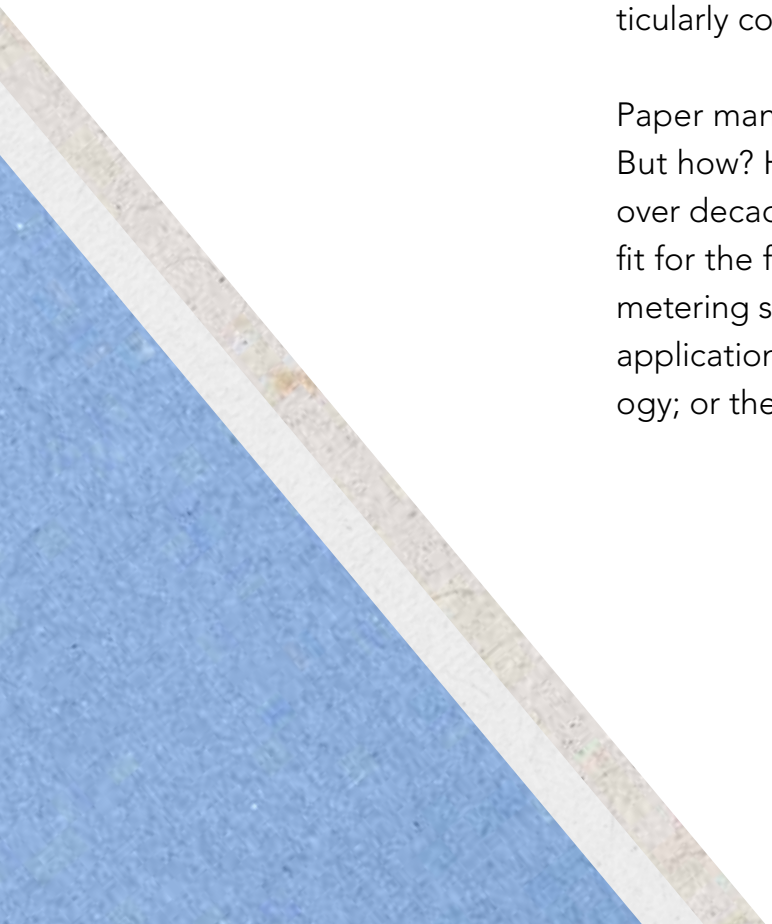
Contour coat for folding boxboard and high-quality paper grades
Profiled metering rods are increasingly being used for very uniform color distribution and coverage. They achieve coating results whose quality is comparable to that of traditional air knives or modern curtain coaters. If all parameters are set correctly, ceramic-coated rods in particular achieve a very economical service life.

All rod ends are available:

TURNING CHANGES
INTO OPPORTUNITIES

The whole world is undergoing rapid change - and so is the paper industry: The still growing online trade is increasing the demand for economical packaging materials and thicker paper grades. New target groups for hygiene products are developing in emerging markets, while demographic change is boosting sales of incontinence products. And in the not too distant future, paper is set to take on new roles in the construction industry as well. For example, as a coating for sheetrock or as a particularly cost-effective building material.

Paper manufacturers must respond to these changes. But how? Horst Sprenger uses the experience gained over decades in the paper industry to make production fit for the future. This may involve retrofitting complete metering systems with drives. Or increasing the range of applications or possible uses by adding coating technology; or the fundamental modernization of filmpresses.



WELL-KNOWN PARTNER,
NEW COMPETENCIES

We at Horst Sprenger recognized the new challenges for the paper industry at an early stage, consistently aligning our portfolio accordingly. What's more - we have developed from a "wear part manufacturer" to a production technology provider. The goals we want to achieve together with our customers are to optimize production costs and to increase competitiveness through innovative solutions.

Concrete examples are our retrofit packages for paper machines. They make the existing technology future-proof in a flash without conversions. During a normal machine down-time, for example, an innovative rod metering system can be integrated as a "plug-and-play" solution. This results in longer service lives, less waste and opens up the possibility of optimally producing coated packaging papers or alternative grades.

LARGER ROD DIAMETERS

IDEAL FOR INCREASED PRODUCTIVITY

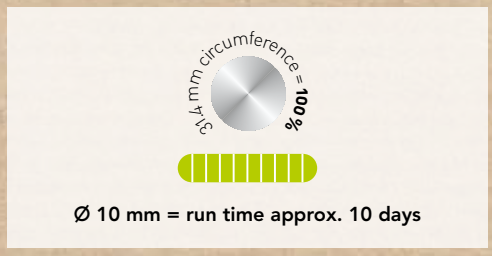
Generally, 10 to 15 mm diameter metering rods with smooth surface are applied in direct coating, or with profiled surface in the filmpress. Depending on the proportion of abrasive components in the coating media, service lives of two to four weeks can be achieved. All this is common practice on paper machines all over the world. But in an increasingly fierce competition, every additional hour of production and minimization of waste counts.

Thus, metering rods must offer a longer service life and fewer inspection cycles. The technologically simple solution is to use metering rods with larger diameter.

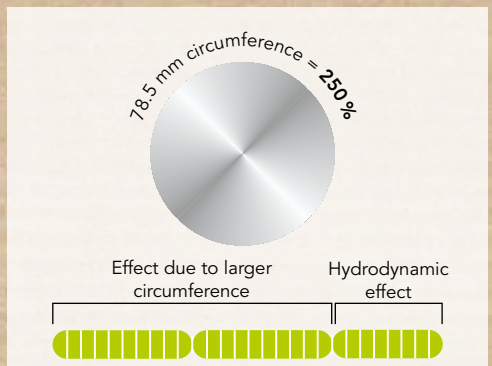
The effects

- The forces responsible for wear act on a larger area, so the metering rods withstand load for a longer period.
- The linear load of the metering rod against the sheet or backing roll is uniform and gentle. This prevents the rod from penetrating, reduces deformation and extends the life of the backing roll cover.
- A hydrodynamic process is created between the metering rod and the sheet, similar to aquaplaning when driving a car - except that it is desirable here: A thin liquid film reduces friction and thus wear on the metering rod to practically zero.

Whereas the first two effects have proportional impacts on the service life of the metering rods, the hydrodynamic effects ensure a significant above average extension of run time. In addition, metering rods with large diameter are clearly more resistant to sheet break, out-of-center drives, and improper handling.



Ø 10 mm = run time approx. 10 days

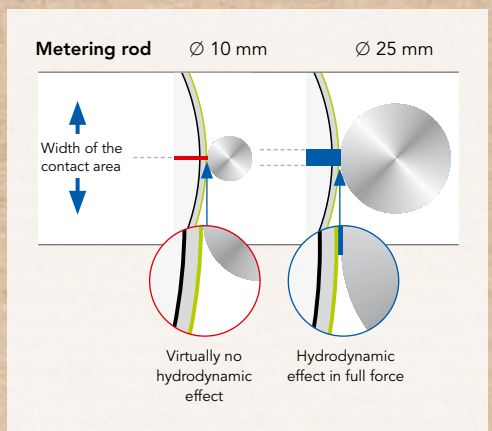


Ø 25 mm = run time approx. 28 days

Example calculation

	Diameter	Ø 10 mm	Ø 25 mm
Product: Paper, wood free	Rod change cycle	every 10 days	every 28 days
	Duration / change	10 minutes	10 minutes
Machine speed: 1500 m / min	Change cycle / month	3 times	1 time
	Duration of change / year	6 hours	2 hours
Coat: 3 g / m² total	Paper machine € / h	20,000 €	20,000 €
	Costs of rod change	120,000 €	40,000 €
Coating method: Surface sizing	**Value of increased productivity**		**80,000 €**
	Waste / change	15,000 m	scheduled replacement*
Metering rods: Profiled geometry	2 unscheduled changes / month		
	Unscheduled changes / year	24	
	Avoidable waste	**360,000 m**	

* no waste is produced during scheduled machine downtimes, e. g. for grade change or machine cleaning



CHROME, CERAMIC, CARBIDE

SPECIALISTS FOR WEAR RESISTANCE

The further development of proven manufacturing processes as well as material innovations lead to greater wear resistance and thus to greater competitiveness. This applies, for example, to hard chromium plating or the ceramic coating of wear parts.

Ultimately, the intended use and application determine the selection:
- **Chrome coatings** – the most economical solution for many applications
- **Ceramic surfaces** – for sophisticated processes with abrasive effects
- **Carbide** – when homogeneity and wear resistance are crucial

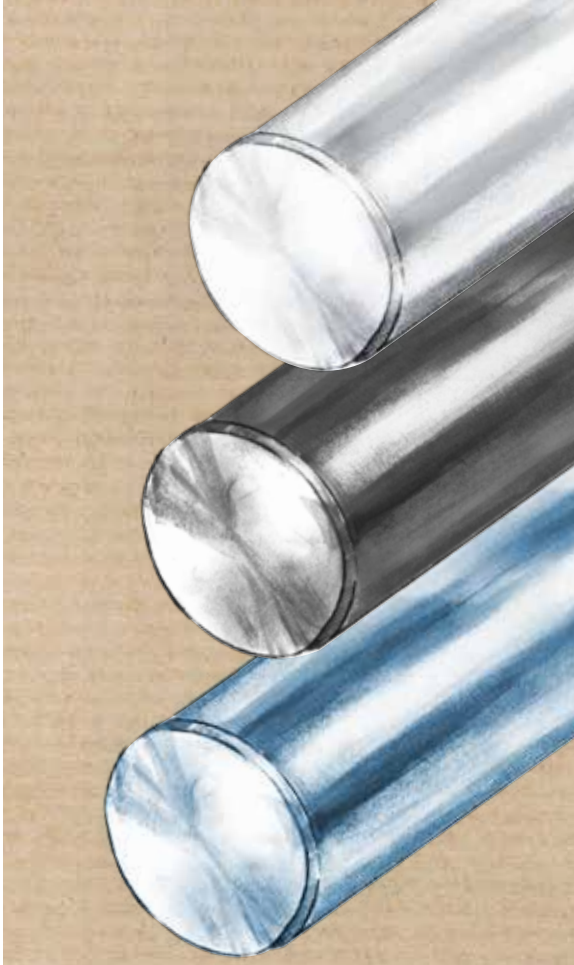
However, it is not possible to generally say which surface finish is ideal for a particular process, as there are very different process parameters:
- Composition of the paper
- Ingredients of coating media
- Coating method (direct or indirect)
- Production conditions of paper and coating machines
- Metering rod (diameter; profiled or smooth)

As specialist for metering systems we concentrate fully on these aspects of paper production. This also includes high quality consulting that is hard to match.

COMPARISON OF SURFACE FINISH

Hard chrome plated metering rods
Galvanic application methods enable a uniform layer thickness over the entire surface. This is a great advantage, especially for profiled metering rods with steep angle geometries.

Thermally coated metering rods
Ceramic coatings are applied by plasma or high-speed spraying method.
The surfaces of the new generation of metering rods are significantly more wear-resistant, which extends their service life by a factor of three to seven.



Material of metering rods:

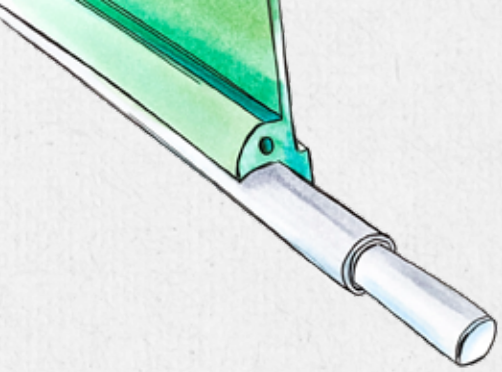
Stainless steel

Chrome plated metering rod

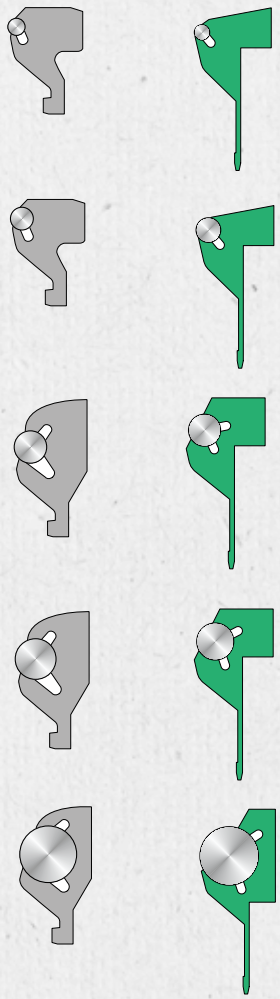
Hardness:	up to 1100 HV
Thickness of layer:	
- smooth rods:	≥ 50 µm
- profiled rods:	25 µm

Ceramic coated rods

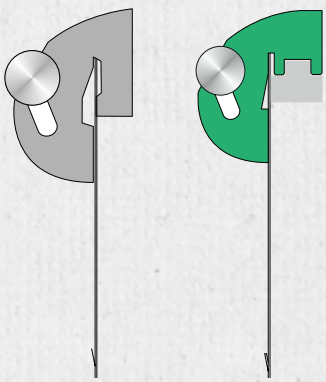
Hardness:	up to 1700 HV
Thickness of layer:	
- smooth rods:	≥ 50 µm
- profiled rods:	25 µm



M-series V-series



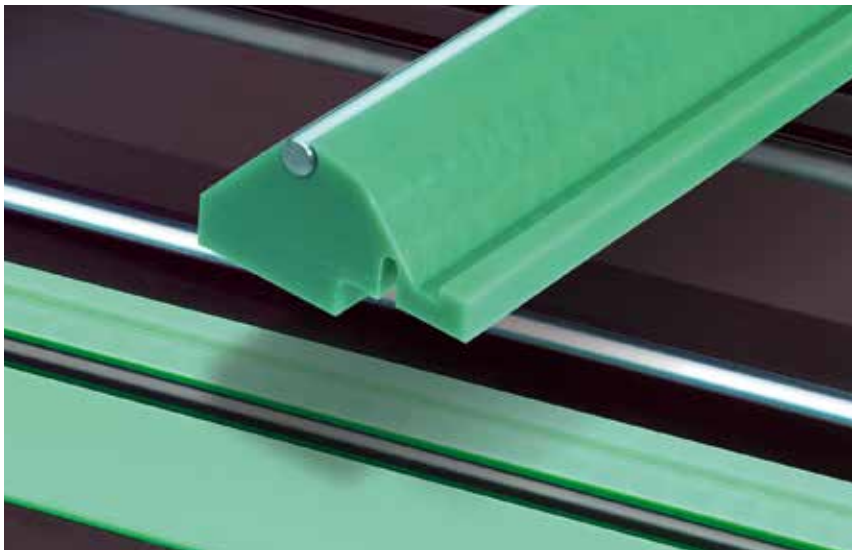
Rod bed with supporting blade



PU - bed PE - bed

ROD BEDS

APPLICATION-RELATED DESIGNS



Varying requirements on metering systems and manufacturer-specific construction of coating stations have resulted in a variety of rod holder types. Generally, systems feature one or two metering rod diameters. In individual cases, up to five different diameters are possible. This is also the reason for the variety of different rod holders.

Three things are decisive for the specification of the rod beds:
- Specified design principle
- Rod diameter
- Material

Since design principle and rod diameter are predefined, the material is an important criterion for the properties of the rod bed. Today, as a rule, Polyurethane (PU) or Polyethylene (PE) are used; older systems frequently still have rod beds made of rubber.

Depending on the material there are different manufacturing processes:
- PU and rubber = molding or extrusion process
- PE = usually milling and planing process

The production method and specific material properties offer different advantages. Finding the optimal material depends largely on the individual requirements. However, there is a trend towards rod beds made of PE.

MATERIALS

THE RIGHT ONE FOR EVERY PROCESS

Polyethylene rod beds

- Machining process
- Low friction coefficient
- Resistant to hydrolysis
- Flexible in design
- Ideal for special shapes
- Allows extended service life

Polyurethane rod beds

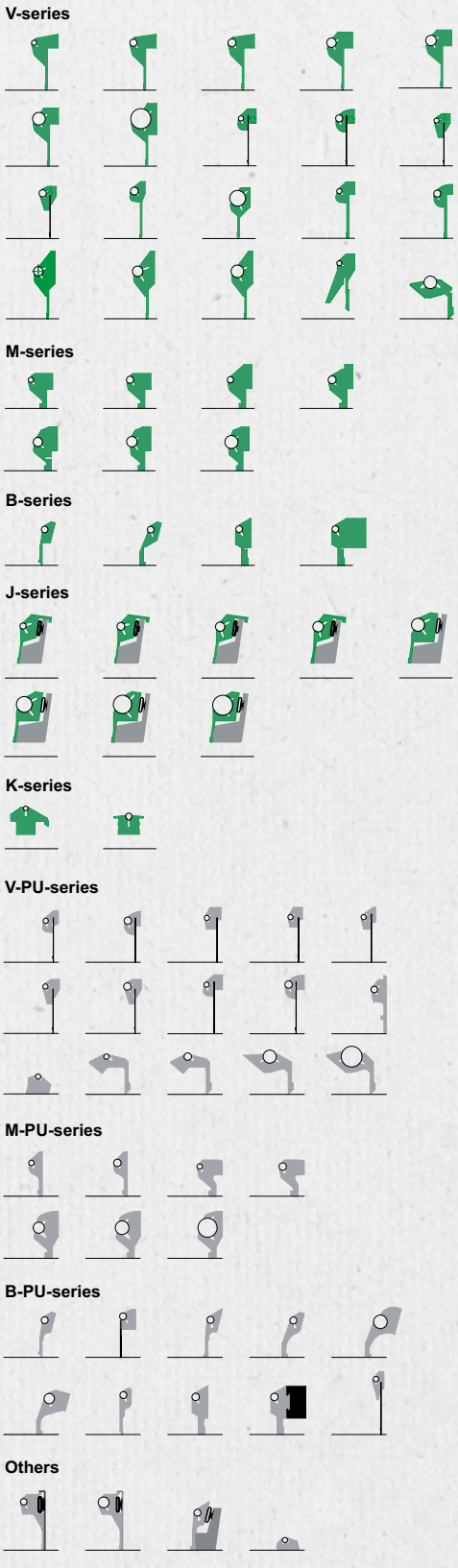
- Molding process
- Adjustable hardness from 55° - 97° shore A
- High elasticity
- High mechanical / dynamic load capacity
- High surface quality
- High resistance to mineral oils, greases, petrol, ozone, UV and high-energy radiation

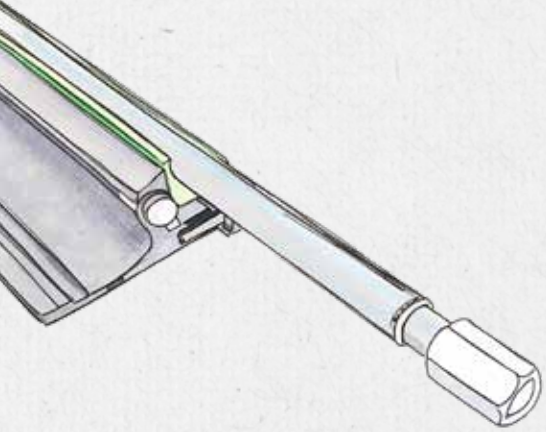
	Polyurethane	Rubber	Polyethylene
Small quantity	-	-	+
Large quantity	+	+	-
Service life	o	o	+
Elasticity	+	+	-
(Production) precision	+	-	o
Resistant to hydrolysis	o	+	+
Expansion coefficient	o	o	o
Friction coefficient	o	-	+
Surface quality	+	o	-

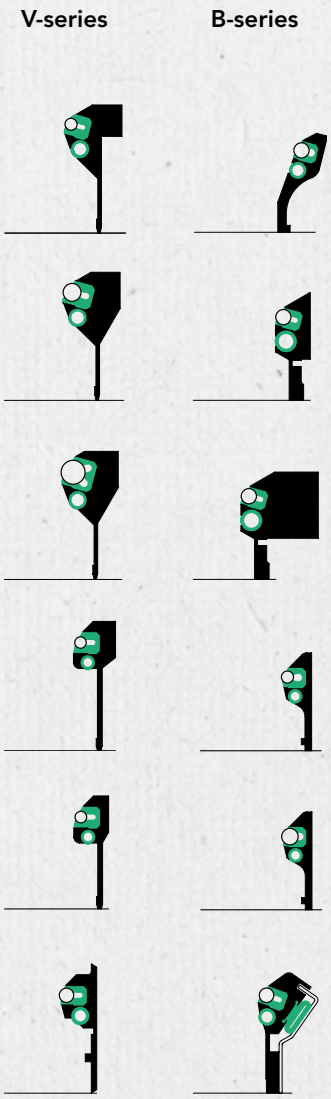
+ Extremely suitable o Suitable - Rather unsuitable

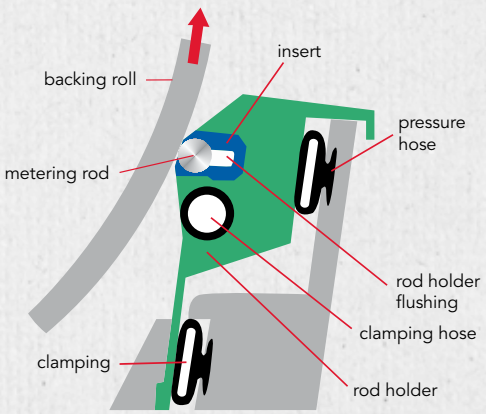
SPECIAL APPLICATIONS: We will be happy to develop special shapes with you!

Variety of shapes of rod beds for all applications



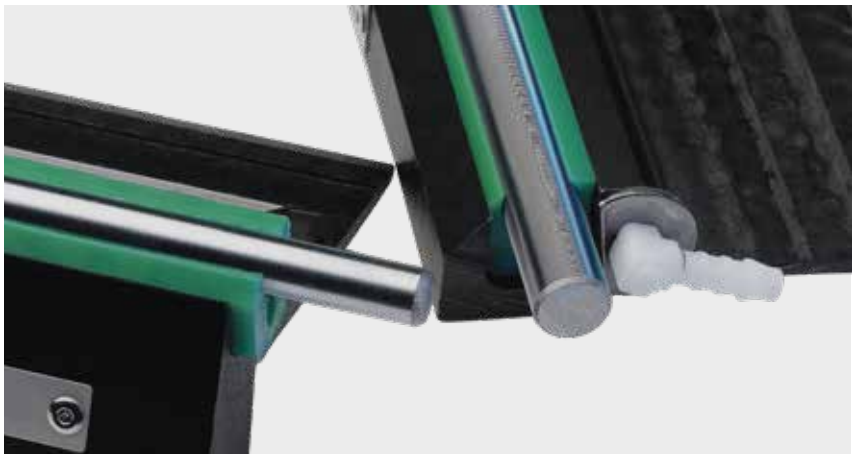






ROD BEDS WITH COMBI SYSTEM CS

WEAR PARTS COSTS CUT IN HALF



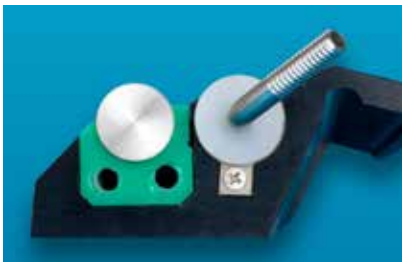
We take a holistic approach to our rod metering system. This means: In addition to rod geometry and material, we also think about the design of the rod bed. This led to the development of the Combi System CS. This multi-part rod system significantly reduces wear costs and thus increases the efficiency of paper production.

The Combi System CS offers cost reductions in the area of the metering system, increased service life due to material improvements, and optimized operating conditions. All in all, this results in a new level of efficiency that ensures clear competitive advantages.

Two parts - two advantages

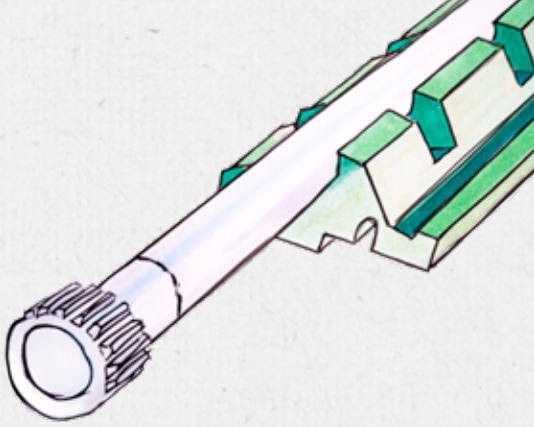
Our technological concept is as simple as it is effective:
We divide the rod bed in two parts. Only the small and therefore cost-effective insert is changed. The holder, which is shaped to match the metering systems, remains in the machine and rarely needs to be replaced. This cuts the wear parts costs for rod beds roughly in half.

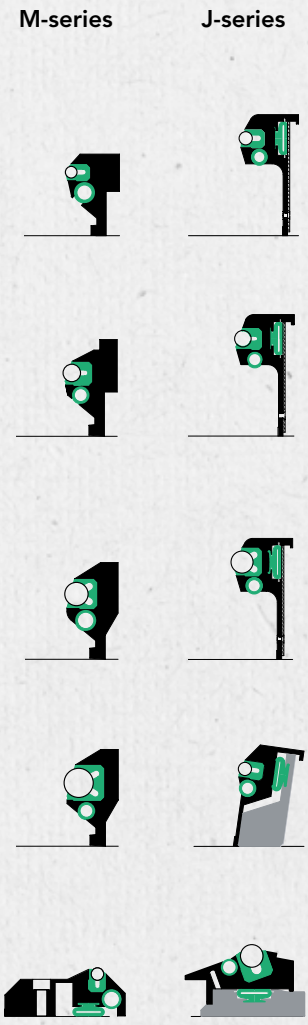
A further advantage of the Combi System CS is reduced replacement time, since the insert can be installed and removed with the metering rod inserted. This in turn results in reduced waste during the changing process.



ROD BEDS WITH COMBI SYSTEM CS

EASIER HANDLING





The optimal material: Polyethylene

The insert is made of high-quality material. Two alternatives are available:

- Extruded material for optimal economic efficiency
- Milled version for maximum precision

APPLICATION EXAMPLE: FILMPRESS

Conventional	Combi System	
Change of rod beds	Change of holders	Change of inserts
40 times per year	2 times per year	40 times per year

SAVINGS of approx. 50% of wear parts costs.

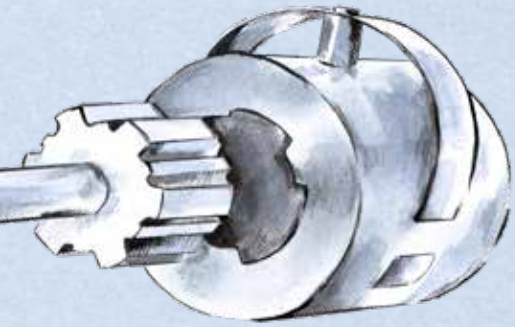
APPLICATION EXAMPLE: DIRECT COATING

Minimizing edge wear

Direct application of abrasive coating media results in heavy wear in the edge areas of the metering rods, even if the boards are relatively thin. In the worst case, the metering rod runs for only a few hours. Our complete metering system features adjustable contact pressure that is applied on the metering rod in the edge area: Since the length of the pressure hoses is adjustable, they can be positioned in such a way that they end at a defined point before the edge. Thus, the pressure is evenly distributed over the entire rod bed and is actually not increased towards the edge.

Easy handling - quick change

Further savings result from the easy handling during change. Time-consuming cleaning of the rod beds etc. is no longer necessary. The insert is simply snapped into the holder without requiring any tools.



QUICK COUPLINGS

QUICK AND RELIABLE ROD CHANGE

Changing metering rods on running machines is comparable to a Formula 1 pit stop: everything must be done as quickly as possible. Because during a rod change, each additional minute results in increased waste. For this reason, so-called quick couplings are applied, though they do not always live up to their name. Frequently they involve conventional quick couplings from other branches of industry that cannot handle the harsh conditions prevailing in the paper industry.

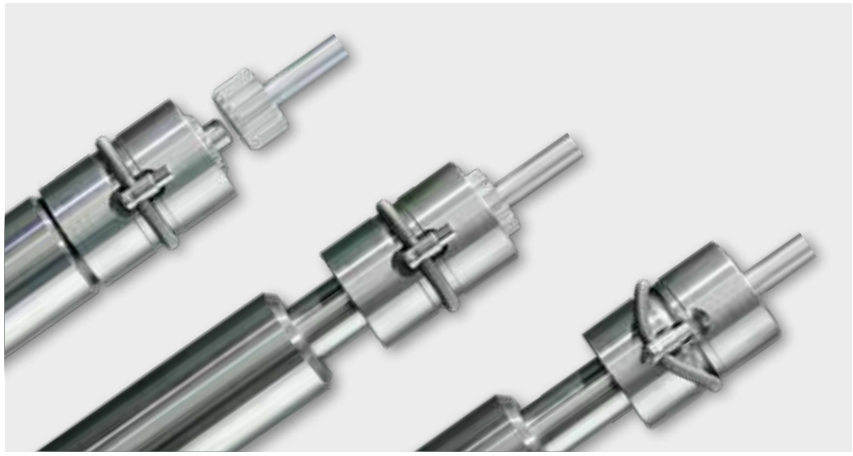
Problems with bolted clamp couplings

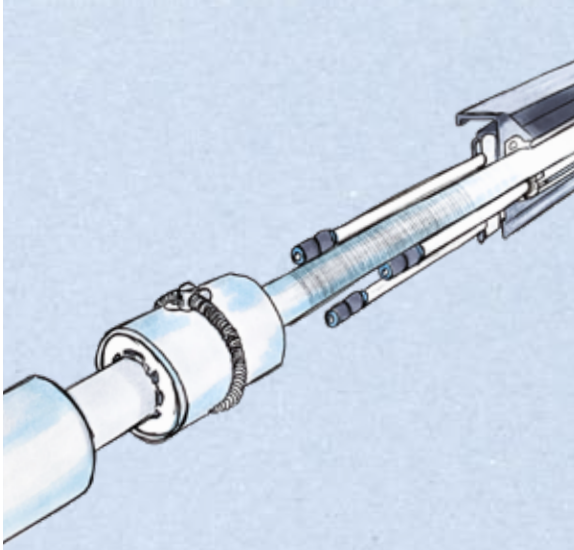
Bolted clamp couplings can be very susceptible to malfunctions, leading to problems that are multiplied when rods are driven on both sides:

- Delicate fastening is not suitable for industrial environment
- Screw heads are subject to clogging and dirt
- Hexagon socket screws are worn out or stripped
- Allen keys are missing
- Drive shafts are in an inconvenient position

DIRECT DRIVE WITH QUICK COUPLINGS

SIMPLE AND ROBUST





Our tried and tested direct drive is probably the most reliable rod drive at all - because it works completely without wear-prone and dirt-sensitive components. Especially the elimination of the normally used shaft joints often leads to a trouble-free operation for many years.

The drive is equipped with a positioning device that aligns the drive coaxially to the metering rod in the operating position. If two different rod diameters are used, the positioning device is equipped with a front and rear stop. This way the two operating positions can be set as quickly and reproducibly as possible.

The quick coupling consists only of a simple driver, which is locked with a spring washer. The driver has internal teeth with rotational play so that it can be pushed onto the end of the metering rod without rotating the drive.

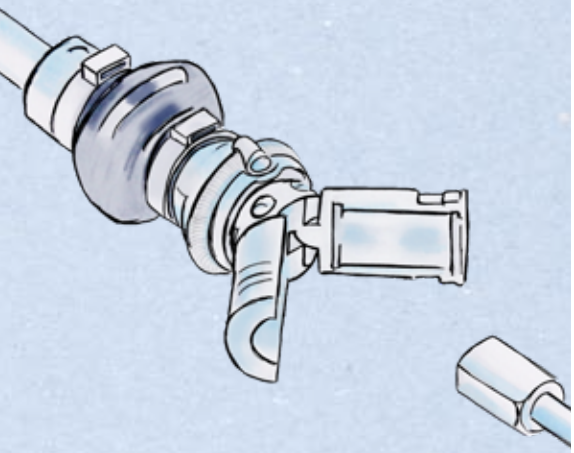
The well-known gear rod end is the preferred metering rod end. Alternatively, the quick coupling is also available in a hexagonal version.

Advantages at a glance

- Tool-free "one-hand exchange"
- Rigid drive shaft without universal joint to ensure reliable operation
- Robust spring ring for quick and easy change
- Massive shaft diameter for smooth running and longer run times

APPLICATION ADVANTAGE:

Optimal smooth run
The rigid and very massive design of the drive shaft ensures optimal smooth running of the metering rods, and thus longer run times. By preventing one single malfunction of a conventional coupling, the investment in our quick coupling may already have paid for itself.



FLEXIBLE DRIVE WITH QUICK COUPLING

PRACTICE ORIENTED ALTERNATIVE

In some applications it is reasonable to use a flexible rod drive. For example, if it is necessary for technological reasons to frequently use different metering rod diameters. Or, if the basic design of the coating station is not suitable for a direct drive.

This is where our completely reworked drive shafts with hexagonal quick couplings come into play. They are available in two sizes, SW36 and SW22, and are fully compatible with numerous solutions used in practice. They can be replaced at any time without any problems.

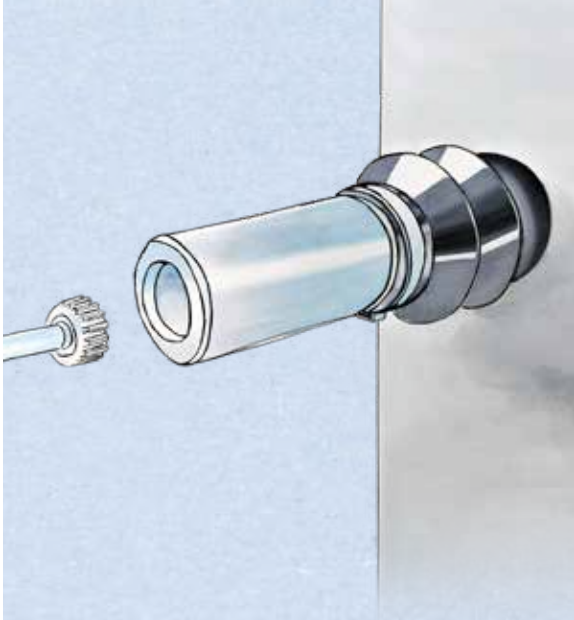
In addition, our hexagonal quick coupling is extremely easy and tool-free to operate, robust and reliable. The built-in rotational play allows coupling by hand without having to laboriously turn the motor. A simple clamping ring is sufficient to lock the coupling. The unlocked coupling opens like a crocodile's mouth, exposing the metering rod end without any further axial movement. Advantage when dealing with dirt during operation: Sliding movements are not hindered by dried coating.

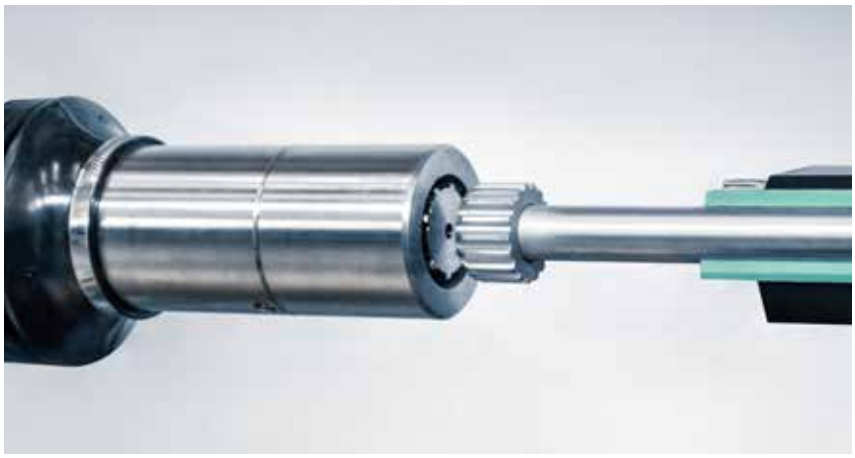
The hexagonal holder is about 10 mm longer than the hexagonal metering rod end. This is sufficient for easy insertion of the metering rod and also compensates for thermally caused length changes.

- Tool-free "one-hand exchange”
- Flexible, for different rod diameters
- Simple spring ring for quick and easy change
- Simple drive shaft without sliding guide

AUTOMATIC COUPLING

COUPLING, AS IF BY MAGIC



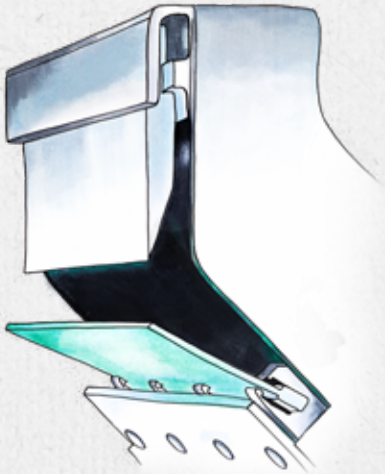


The latest in the field of rod drives is our automatic rod coupling. As a further development of the direct drive, the driver is no longer manually operated when using the automatic coupling. It is locked by spring force and unlocked by compressed air.

This means that the operator does not have to open or close the rod coupling manually during rod change. He can immediately remove and reinsert the rod system without having to worry about the coupling of the metering rod.

Only the driver is exposed and therefore visible. All other components have been integrated into the system in an absolutely dirt-resistant manner.

- Automatic coupling process
- Rigid drive shaft without universal joint to ensure reliable operation
- Massive shaft diameter for smooth running and longer run times



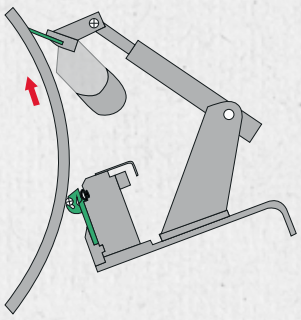
EDGE DOCTOR

CONTROLLED COATING OF FILM

Due to production factors, the coated film must be wider than the sheet. This results in an "excessively" applied coat in the edge area of the rolls that must be removed in order not to impair production.

Usually, the coat from the edge area is removed by trailing blades. This technology is widely used but outdated; this can easily be explained with the laws of physics and mechanics:

- High forces must be exerted to reliably remove the excess media.
- High forces cause extensive wear to the blade; the function can decrease uncontrollably.
- The arrangement of the blade leads to a converging gap which acts like a "trap" for agglomerates and fibers. These can grind into the roll and thus increase roll wear.

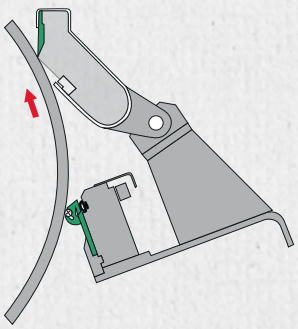


Problematic conventional edge doctoring

The advantages of edge doctors

Our edge doctors have already proven themselves in numerous applications in the paper industry. The edge doctor is configured for optimal performance, without penetrating the roll. The required contact pressure is provided by the net weight of the blade alone. This design principle uses the leverage of a doctor much more efficiently and offers numerous advantages:

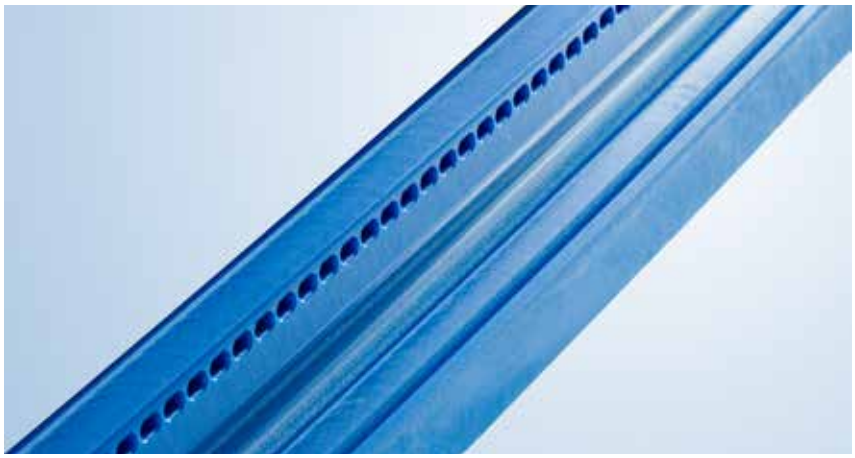
- Uniform contact pressure
- Compensated blade wear
- „Soft" PE blade protects the roll
- Change can be performed on running machine
- Functional catch box
- Improved functionality
- Tried and tested throughout the world
- Additional sealing blade for increased cleanliness

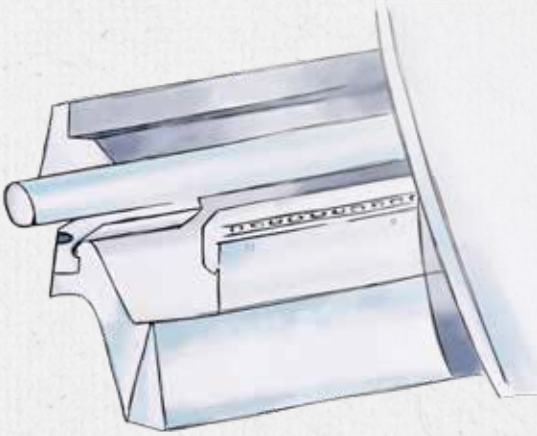


Our edge doctor solution

SEALING DOCTOR

THE NEW ONE-PART SEALING DOCTOR SOLUTION





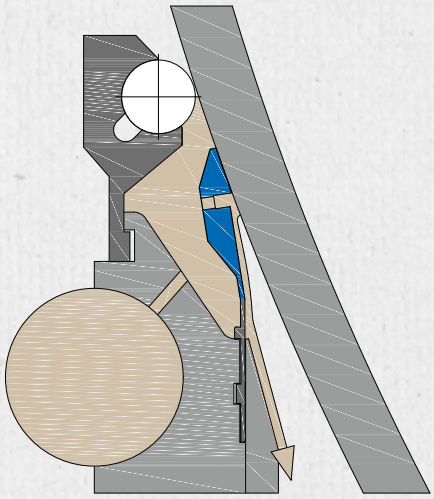
The coating is usually supplied via a metering chamber, which is designed differently depending on the type. This metering chamber is sealed towards the coating roll with a slotted sealing blade or an overflow bar with a gap. Both systems have existed side by side for a long time and are largely determined by the choice of the machine manufacturer.

The overflow gap requires a relatively large surplus in the coating chamber to seal it against air entrapment. However, the function of the overflow gap system is highly dependent on the thermal and mechanical stability of the coating station.

The sealing blade manages with much lower circulation rates and is much less dependent on thermal influences and mechanical deviations. The major disadvantage of the sealing blade is its safety: As the blade tip grinds on the coating roll, the blade becomes razor sharp over time. This can lead to serious cuts - not only when changing the blade, but also when changing the rod metering system.

Simply better – the new sealing doctor

As a one-piece, slotted sealing element, our sealing doctor works virtually wear-free. It has an improved cleaning effect on the coating roll, which results in fewer rod streaks caused by particles from the return film. Above all, it offers an enormous advantage in terms of occupational safety, as there are no sharp edges.



Coating chamber with new chamber seal

PERFECT SUPPORT

FROM PLANT ENGINEERING TO ACCESSORIES

As specialist for metering systems, in addition to our products we also provide a high level of support which helps to optimize paper production. It starts with the planning of production changeovers based on our more than 40 years of experience. Numerous projects - such as conversions from blade coaters to rod metering systems, including design and installation - demonstrate the quality of our support.

COMPETENCE
IN PRACTICE

Our goal is to provide metering systems that are reliable from the start. But we are also on the spot during regular everyday production when quick troubleshooting is required. We continuously expand the necessary know-how. In addition to monitoring trials, we are involved in concept, design, and prototype development.

ACCESSORIES
OPTIMIZE THE OPERATION

We offer customized accessories for the major work steps; this allows full utilization of the performance of our products. This includes:

- Packing cases for transport and storage (to protect the metering rods)
- Transport aids (from warehouse to machine)
- Insertion aids for metering rods
- Cleaning tanks
- Washing stands

FOCUS ON THE PAPER INDUSTRY

TARGETED SUPPORT OF CUSTOMER SUCCESS

HORST SPRENGER

Horst Sprenger GmbH Spezialwerkzeuge
For more than 40 years, our company has been concentrating on metering systems. The skills acquired during this period are available to our customers at all times and places. This is ensured by our international presence, competent and quick on-site service, as well as our global distribution network.

State-of-the-art manufacturing technology
We produce all our metering rods in our facility in Moers, Germany. The high-precision production is carried out on latest CNC machines and coating systems.

Quality by tradition
Continuous advancement is an important component of our company policy. This is ensured by our partner company, Clouth Sprenger, featuring its own technology lab. It is used for tests and evaluations, and at the same time an important part of our internal quality assurance.

IBS PAPER PERFORMANCE GROUP

HS Packaging

IBS Paper Performance Group

The IBS Performance Group is present wherever the paper industry is at home. Among other things, the company stands for state-of-the-art production methods, first-class products and unique system solutions. A comprehensive know-how for the paper industry - distributed among specialists from different areas - is bundled under the umbrella of IBS. One of them is Horst Sprenger.

Horst Sprenger GmbH Packaging

Our individual export cases made of wood and corrugated cardboard, which can be up to twelve meters long, are ideal for bulky goods such as metering rods. Special packaging, transport racks, and wrap-around systems are produced in compliance with the respective export regulations.

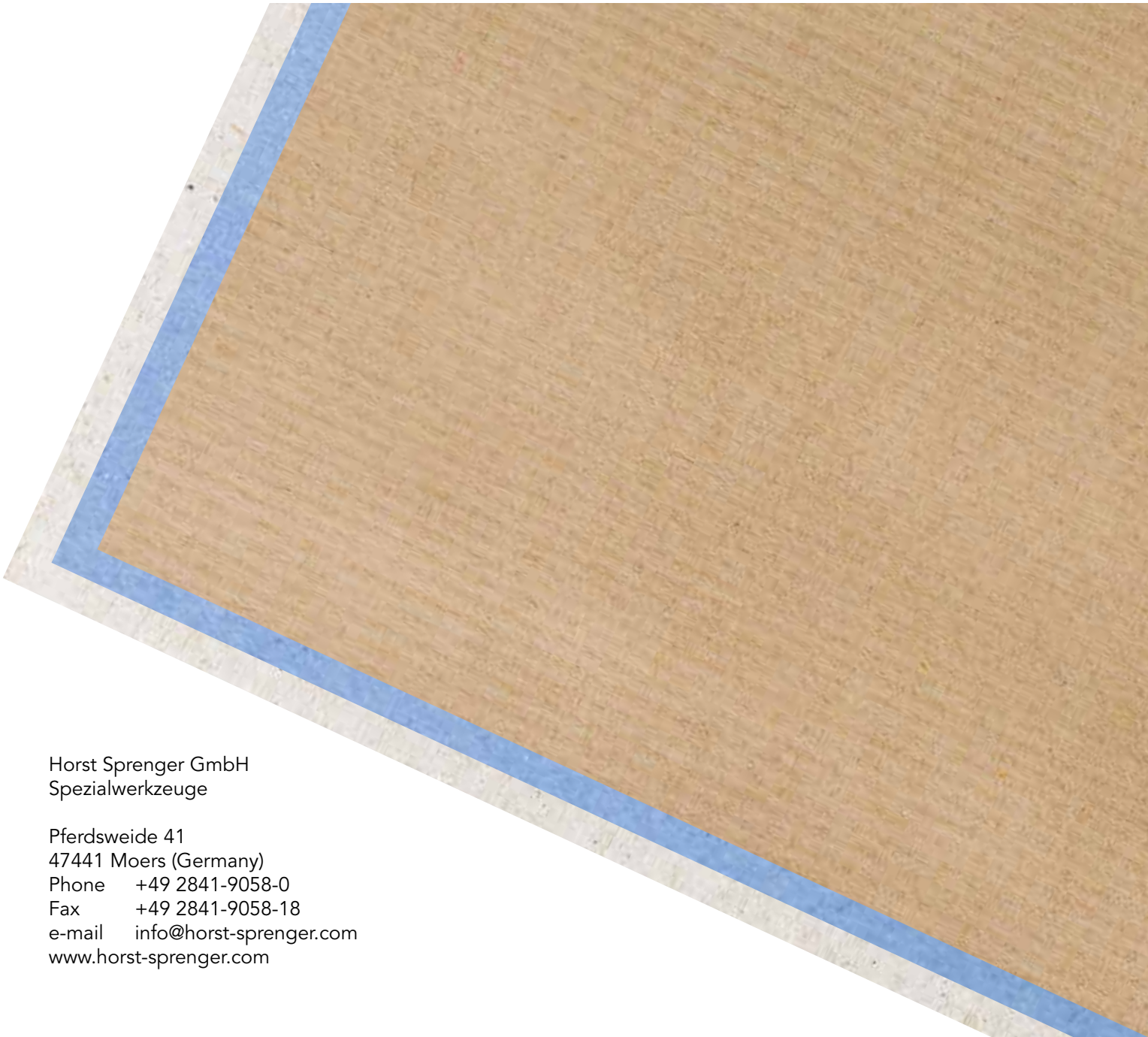
HORST SPRENGER

member of IBS PAPER PERFORMANCE GROUP

www.ibs-ppg.com

DO YOU HAVE ANY QUESTIONS? WE LOVE TO ANSWER THEM!

Information about our company or our products can be obtained quickly and competently from our contacts.



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