

Efficient Solutions for
Thin Film Equipment





YOU ARE DRIVEN BY DEMANDS FOR ...

- Higher quality and reliability
- High process reliability
- Short cycle times
- Low costs per piece
- Flexibility, various modular expansion options
- Future-oriented technology
- Individually tailored coatings
- Low level of maintenance
- Low demand of spare parts
- Efficient after-sales service

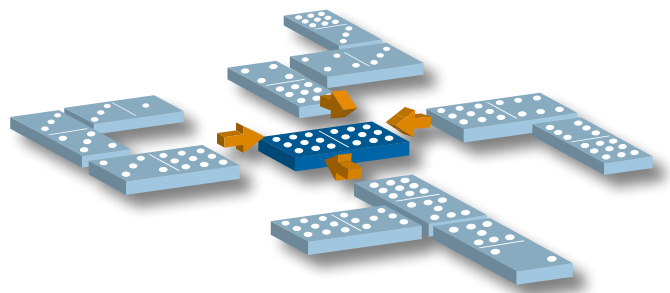


One Technology Platform – Various Possibilities

Tailoring multiple modules to individual demands and building a great unit – this is the basis of the **METAPLAS-DOMINO**. State-of-the-art Thin Film equipment has been developed with the knowledge of nearly 30 years of experience in tool manufacturing industry. For Sulzer Metco Thin Film, this means offering efficient system solutions and even setting trends in surface treatment. Due to the following modules, flexibility and future solutions are guar-

anteed: APA ARC, Sputtering, DLC, Combi and the latest HIPAC technique (High Ionisation Plasma Assisted Coating). The modular and flexible concept of the Thin Film equipment allows further expansions and upgrades.

- Diverse combination possibilities
- Later expansions possible
- Patented processes and coatings
- Production and R&D support

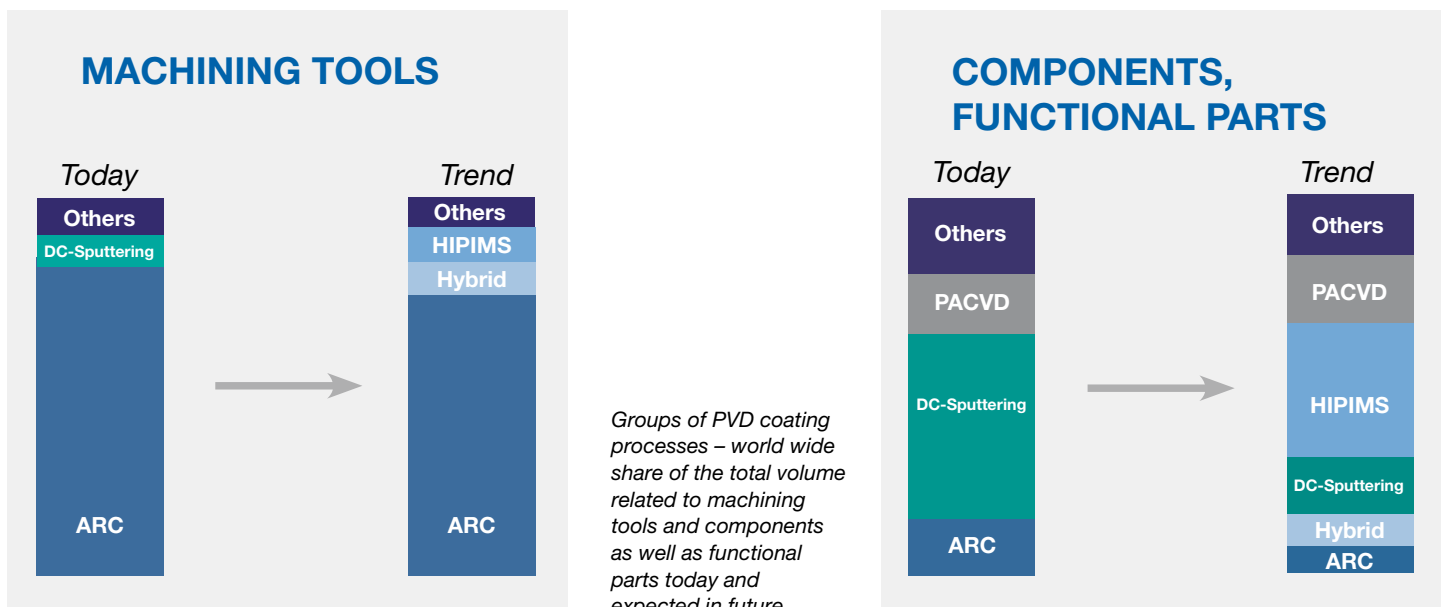


Future Solutions

Thanks to the technology platform **METAPLAS-DOMINO**, customers of Sulzer Metco Thin Film are able to develop their own surface solutions for both current and upcoming trends. **HIPAC** offers a huge potential for deposition of morphological dense coatings at low substrate temperatures. New opportunities are opened up for

the coating of components, wear parts and also functional parts. In this area DC sputtering is well presented. Already today everything points to partial substitution of sputter technique due to **HIPIMS** (High-Power Impulse Magnetron Sputtering), as well as newest hybrid techniques. The **hybrid technology** from Sulzer Metco Thin Film –

the combination of APA ARC and HIPAC – contributes to the most innovative approaches in surface coating. For those being real experts in both technological areas, completely new opportunities arise – today and in the future.



Modules of Technology Platform **METAPLAS-DOMINO**



APA ARC

The innovative APA evaporator technology (**A**dvanced **P**lasma **A**ssisted) is based on cathodic vacuum ARC and offers diverse development possibilities for new layer architectures in terms of morphology, stoichiometry, doping, multi and nanolayers.

Benefits:

- High target utilisation
- Low target costs
- High deposition rate
- Short target changing times
- Adjustable magnetic fields
- High plasma density
- Excellent coating adhesion
- Smoother coatings through the reduction of macro-particles
- **BASIS FOR INNOVATIVE HYBRID TECHNOLOGY**



Sputtering

In the sputtering process, atoms are extracted from a target by bombardment with high-energy ions (Argon) and transformed into the gas phase. By combining the sputtered material with additional gases (reactive sputtering), a coating is deposited on the substrate. This can be carried out with the use of magnetron sputtering modules such as DC, DC pulsed, RF, MF, as well as high pulse power supplies (HIPIMS).

Benefits:

- A wide range of materials can be sputtered
- Diverse process variants available
- Balanced (BM) and unbalanced mode (UBM)
- Smooth coatings
- Good coating adhesion in combination with AEGD



HIPAC

HIPAC stands for **H**igh Ionisation **P**lasma **A**ssisted **C**oating and is the combination of the patented highly efficient plasma cleaning process AEGD (Arc Enhanced Glow Discharge) and HIPIMS (High-Power Impulse Magnetron Sputtering).

Benefits:

- Ionisation rate similar to ARC process (up to 90 percent)
- High-power densities from 100 to 1000 W/cm² can be set
- Very high plasma density through AEGD excitation
- Tailored layer structures
- Very smooth coatings
- Excellent coating adhesion
- Deposition of morphologically dense coatings at low substrate temperatures
- **BASIS FOR INNOVATIVE HYBRID TECHNOLOGY**



DLC

DLC stands for **D**iamond-**L**ike **C**arbon and refers to a group of extremely low friction amorphous carbon coatings. With a DLC module, different DLC coatings can be produced by using PVD and/or PACVD processes. Standard DLC coatings consist of metal free or metal containing carbon coatings such as W:C-H coatings as well as DYLYN® and CAVIDUR® coatings.

Benefits:

- PACVD combined with PVD processes
- Different DLC coatings possible
- Excellent coating adhesion
- High wear resistance
- Low coefficient of friction
- Smooth coatings



Combi

With a combi module, a plasma nitriding process can be performed before a PVD and/or PACVD coating process in one system. Thereby a hardened layer can be produced which offers excellent support for the subsequent PVD/PACVD coating. The Combi Treatment can be produced in one batch.

Benefits:

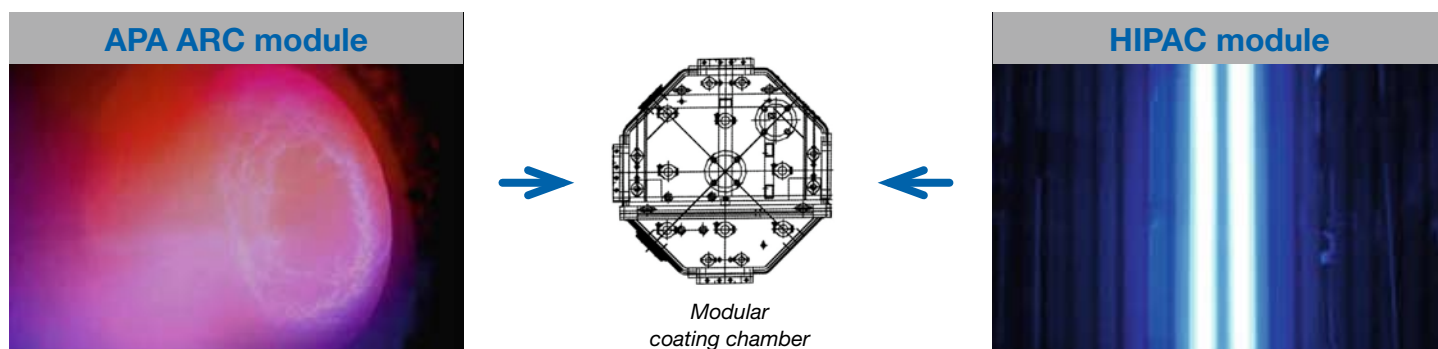
- Optimisation of tool and component properties
- Substitution of expensive materials
- Significantly longer lifetimes
- Flexible due to a high variety of coatings
- All PVD coatings can be applied
- Significant improvement in fatigue strength
- Mechanical properties of the base material remain the same

Innovative Hybrid Technology for New Coating Trends

In the past, the combination of ARC and sputtering did not lead to significant benefits due to the different characteristics of both processes.

Now, the development of the HIPAC module offers the possibility to combine two high ionisation processes (APA ARC + HIPAC) within an innovative hybrid technology that is perfectly suited to industrial and production-related requirements. For the first time, process and material combinations

can be applied, that offer completely new opportunities for high-performance coatings. HIPAC allows evaporating materials for creating new coatings which cannot be deposited using standard processes. For those being real experts in both technological areas, completely new opportunities in layer design open up. Compositions can be tailored to the relevant applications by micro alloying, doping and layer architecture.



Technical Features of the PVD System Concept



	DOMINO <i>mini</i>	DOMINO S	DOMINO L
Usable Coating Volume:	Ø 300 mm x 300 mm	Ø 400 mm x 500 mm	Ø 600 mm x 700 mm
Available Coating Modules:	ARC, SPUTTER, HIPIMS, HIPAC, DLC, COMBI		
APA Arc Evaporators:	2 to 6	3 to 12	4 to 16
Available Power Supplies:	DC and DC Pulse	DC and DC Pulse	DC and DC Pulse
Magnetron Sputter Sources:	1 to 3	1 to 4	1 to 4
Available Power Supplies:	DC, DC Pulse, HIPIMS, MF, RF	DC, DC Pulse, HIPIMS, MF, RF	DC, DC Pulse, HIPIMS, MF, RF
BIAS Modules:	Bipolar Pulsed, 100 Hz – 20 kHz, 25 A, 1000 V	Bipolar Pulsed, 100 Hz – 20 kHz, 30 – 60 A, 1000 V	Bipolar Pulsed, 100 Hz – 20 kHz, 30 – 60 A, 1000 V
	Optionally available: MF and RF BIAS supply		
Plasma Cleaning:	All systems equipped with patented Power Etching Process AEGD.		
Gas Modules:	All systems with Nitrogen and Argon, optional Acetylene and Oxygen available		
Substrate Table:	5 shafts	6 shafts	9 shafts
Other than this DOMINO series, additional system sizes are available, e.g. for coating big parts and long parts.			

METAPLAS-DOMINO – High Capacity for Reduced Cost Per Piece

The costs per piece of a coating process are mainly defined by the loading capacity of the machine. At the same time, a high loading capacity influences the plasma conditions and therefore also the coating quality. For a high loading capacity combined with an excellent coating quality we offer a variety of standard substrate holder solutions for tools.

The table below shows some examples of different tools with 3-fold rotation on a standard substrate holder. We also offer customised substrate holders for optimized loading capacities.



Three-fold substrate holder (3-fold planetary)

Tool Dimension	DOMINO mini	DOMINO S	DOMINO L
End mill Ø 6 x 55 mm	400	720	1296
End mill Ø 10 x 70 mm	240	480	900
End mill Ø 12 x 80 mm	210	432	810
End mill Ø 14 x 100 mm	120	384	720
End mill Ø 16 x 110 mm	110	252	504
End mill Ø 20 x 120 mm	90	180	360
End mill Ø 25 x 160 mm	35	96	216
Hob Ø 100 x 100 mm	15	30	63

Loading Capacity in Piece per Batch

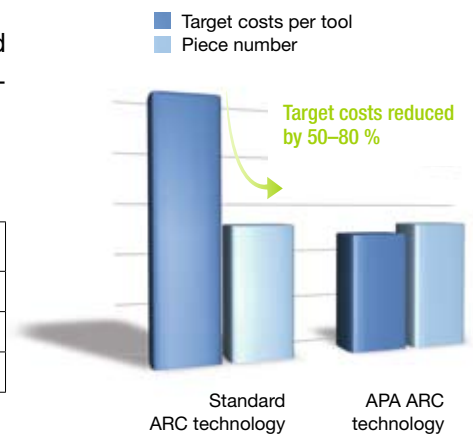
Low Target Costs Reduce Cost Per Piece

Besides the loading capacity, the target costs are the major factor in the cost per piece calculation. With our innovative APA ARC technology, the target

costs have been drastically reduced thanks to a significant increase in target utilisation.

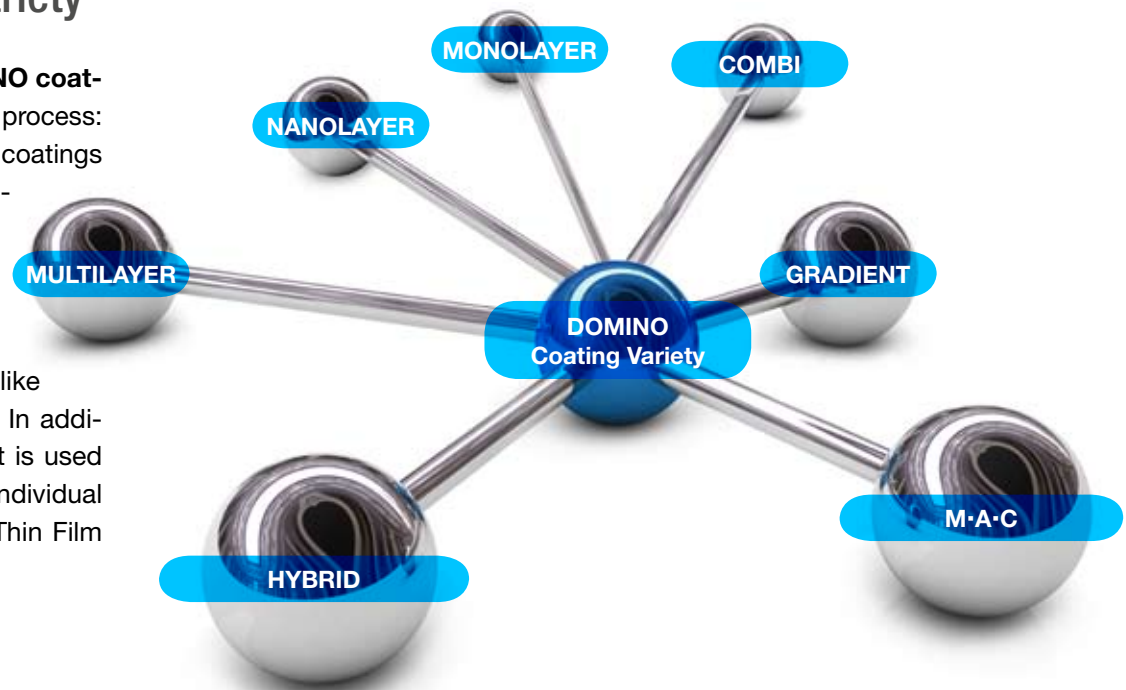
Coating	M _{tec}	M _{power}
DOMINO mini	0.07 – 0.08	0.11 – 0.13
DOMINO S	0.05 – 0.06	0.08 – 0.10
DOMINO L	0.04 – 0.05	0.06 – 0.08

Target costs (APA ARC) per tool in Euro for end mill Ø 10 mm x 70 mm



Benefit from the Variety

Take advantage of the **DOMINO coating variety** in your production process: from already proven standard coatings like TiN, TiCN or CrN over globally successful developments like AlTiN-Saturn to our latest innovations such as **hybrid coatings** or **M-A-C** (Micro Alloyed Coatings) like **M_{power}**, **M_{tec}**, **M_{force}** or **M_{flex}**. In addition, the Thin Film equipment is used for the development of more individual coatings – by Sulzer Metco Thin Film or by users.



WHAT CAN WE DO FOR YOU?

In addition to high quality, innovation and constant development, we offer:

- Consulting and engineering
- Qualification
- Training
- Technology centre
- Turn-key solutions
- After-sales service
- Maintenance contracts
- Application-specific pre- and posttreatment

If you want to carry out the the coating process yourself and integrate it into your manufacturing process: Sulzer Metaplas plans, develops, assembles and supports the operation of your equipment – including all peripheral equipment.

Customer-Specific Solutions

Where standards reach their limit, special solutions are required. Specified process methods, particular components, special applications or even specific production conditions require a system design and configuration that differs from standard concepts. We develop and engineer these systems for and together with our customers.

IONIT OX®

For the first time IONIT OX® has combined conventional processes such as gas nitriding/nitro-carburizing, plasma nitriding and oxidation and achieved excellent results. The process offers excellent corrosion and wear protection, very good friction and sliding properties, increased surface hardness, as well as enhanced fatigue resistance. It is mainly used for serial production in the automotive industry as well as in the areas of mechanical and system engineering. We also offer system solutions for the above processes upon request.



IONIT OX® system

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The marked location is specialised in development and sales of Thin Film Equipment.

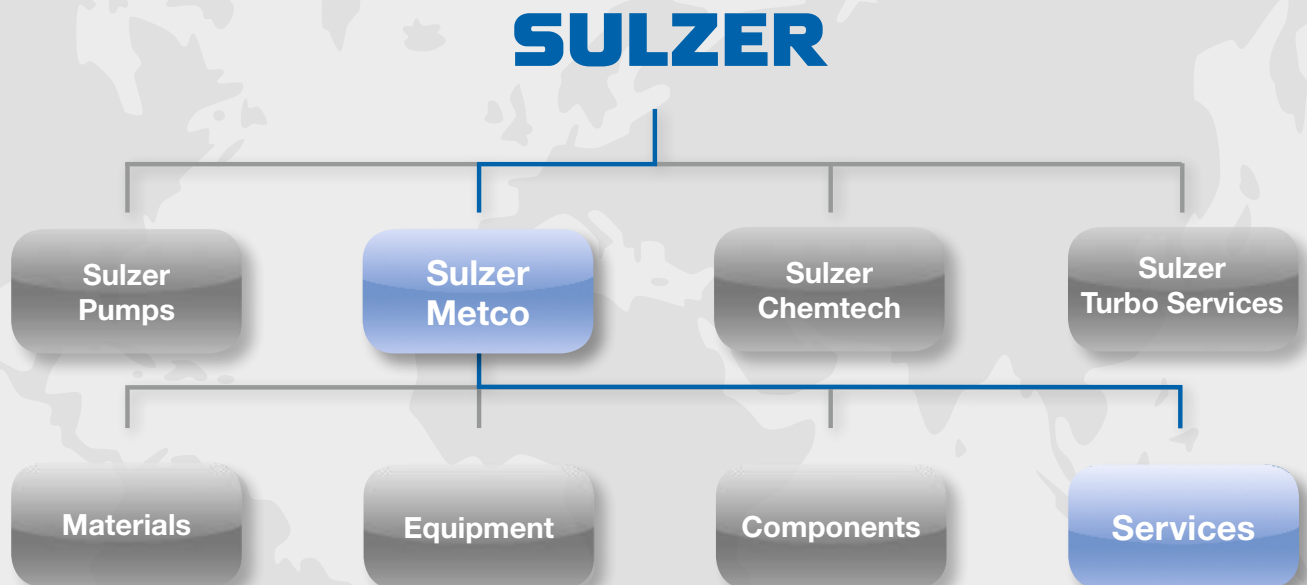
Sulzer Metco Thin Film

The company stands for many decades of coating expertise within the entire process chain – both in coating services and in thin film equipment. Under the umbrella of the the Sulzer Group, established in 1834 and based in Winterthur (Switzerland), the divisions are global leaders in their respective markets.

The division Sulzer Metco coats and refines surfaces. As part of this division, the Business Unit Services guaran-

tees the expertise of Sulzer Metco as a solution provider of surface coatings worldwide.

New employees, new locations and constant innovations expand and strengthen our development, production and service network so that we are closer to customers and can respond faster. The headquarters of Sulzer Metco Thin Film are located in Bergisch Gladbach near Cologne, Germany.



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