shaping your dreams

SOMTA
World Class Cutting Tools

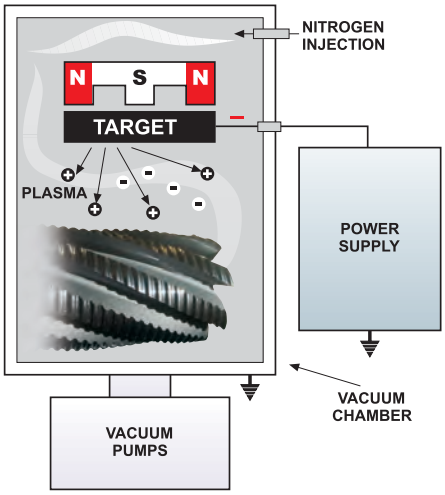
OSG GROUP COMPANY

J O B C O A T I N G D I V I S I O N

The principle behind cutting edge material design

To combine the highest fracture resistance in the bulk substrate and the best wear resistance in the coating

Somta has an integrated state-of-the art Balzers PVD Rapid Coating System and a NEW PerformCoat PfC540 PVD Coating Machine in its manufacturing & coating programme.



What is PVD coating?

PVD stands for Physical Vapor Deposition. It is a process carried out under high vacuum and, in most cases, at temperatures between 150 and 500°C.

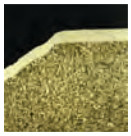
How does the PVD process work

In the PVD process the high purity, solid coating material (metals such as titanium, chromium and aluminium) is either evaporated by heat or by bombardment with ions (sputtering). At the same time a reactive gas (e.g nitrogen or a gas containing carbon) is added; it forms a compound with the metal vapour which is deposited on the tools or components as a thin highly adherent coating. A uniform coating thickness is obtained by rotating the parts at a constant speed about several axes.

Coating properties (such as hardness, structure, chemical and temperature resistance, adhesion) can be precisely controlled.

PVD processes include Arc evaporation, Sputtering, Ion plating, and Enhanced sputtering.

Benefits of PVD coating



- Only 0.003mm thickness
- Harder than steel
- Ceramic properties
- Follows surface structure exactly

Comparison between PVD & CVD Coating

Properties	PVD	CVD
Deposition temperature	500°C	1000°C
Residual stress of coating	compressive	tensile
Toughness	high	low
Thermal cracks	no	yes
Maximum thickness coating	6 µm	>20 µm
α-Al_2O_3	no	yes

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Main benefits of Coatings on Somta Cutting Tools

To gain the most benefit, it is important to match coating to substrate and workpiece material.

High Vanadium
- Improves toughness

High Cobalt
- Increases thermal resistance

Better sliding properties due to higher surface quality
- Improved chip flow
- Lower susceptibility to cold welding
- Enhanced workpiece surface quality

Increased hardness and residual compressive stress ratio
- Outstanding fidelity of edge geometry
- Excellent coating adhesion
- Uniform wear behaviour

Greater wear resistance
- Lower tooling costs
- Increased tool service life
- Fewer tool changes
- Extra regrinding cycles

Greater thermal and chemical resistance
- Dry machining
- Higher cutting speeds and feeds
- Less cratering

In addition to coating our own tooling, Somta coats **gear cutting tools, piercing punches, moulds, dies, dental inserts, broaching blades and inserts** of all different sizes for customers. Coating these items can improve their life span by **200% to 300%** and when used in certain applications, can increase speeds and feeds by as much as **50%**. Somta can coat any component up to **600x600x650mm** (WxDxH).

Gear cutting tools especially are more expensive than common cutting tools therefore cost savings on them are essential. Coating your gear cutter in the same way you do other cutting tools reduces wear by preventing direct contact of chips with the tool, reducing build up along the cutting edge and avoiding welding of chips to the tool.

The high hardness of a coating prevents abrasive wear on the tool, and the lower coefficient of friction reduces the heat and wear generated during cutting operations. Thermal stress on the tool is reduced due to the low thermal conductivity of coatings, which allows heat to be retained in the chip.

oerlikon balzers

Markedly improved tool and component performance with Balzers' thin-film coatings. BALINIT coatings are just a few thousandths of a millimetre thick, but harder than steel. These low-friction, thin-film coatings are extremely wear-resistant as well as chemically inert. The optimum coating is determined both by the intended usage conditions and economic considerations.

Coating	BALINIT A	BALINIT B	BALINIT FUTURA NANO	BALINIT ALCRONO PRO
Coating Material	TiN	TiCN	TiAlN	AlCrN-based
Coating Technology	Arc	Arc	Arc	Arc
Coating Hardness H_{IT} [GPa]	30 +/-3	37 +/-3	33 +/-3	36 +/-3
Coefficient of friction (dry) vs. steel	~0.6		~0.6	~0.6
Intrinsic Stress [Gpa]	-2 +/-1	-3 +/-1		-3 +/-1
Max Service Temperature (°C)	600	400	900	1100
Process temperature (°C)	< 500	< 500	500	< 500
Coating Colour	gold-yellow	blue-grey	violet-grey	bright grey
Application	HSS Drilling Tapping Hobbing Plastic Moulding	Tapping Piercing Punches	HSS & Carbide Drilling HSS & Carbide Milling Hobbing Mould & Die Punching & Forging	Carbide Milling in Steel up to 52HRC

All given data are approximate values, they depend on application, environment and test conditions.

BALINIT A - TiN

Titanium nitride from the start – The world's first wear protective PVD coating

It all began with titanium nitride. BALINIT® A moreover continues to be a versatile wear protection coating that provides effective reduction of abrasive and adhesive wear in many varied applications. It is also applied decoratively or as a wear indicator.

Initial trials of TiN-coated forming tools in 1977 were very successful: service life was increased by a factor of 4. Development and marketing of PVD hard coatings for tools was given the official go-ahead one year later on 1 September 1978.

Advantages of BALINIT A - TIN

- ► Balzers's first wear protective PVD coating
- ► Versatility since 1978
- ► Food-safe
- ► Decorative gold-yellow colour

BALINIT B - TiCN

Wear protection under extreme conditions

BALINIT® B coated tools are characterized by very high hardness and good toughness. This coating is especially wear resistant and its low coefficient of friction provides tools with effective protection against cold-welding. BALINIT® B is moreover food-safe.

The proven TiCN-coating displays its special strengths in tapping and thread forming, high load punching and metal forming applications.

Advantages of BALINIT B - TICN

- Very high hardness
- Good toughness

BALINIT FUTURA NANO - TiAIN

High performance for metal forming and precision components

The high hardness and tenacity of BALINIT® FUTURA NANO gives outstanding protection against abrasive wear and erosion, making it ideal for highly stressed precision components even under high thermal conditions. This is also the major benefit for plastic injection moulding and HSS and carbide tools.

The titanium aluminium nitride (TiAlN) structure results in an optimal relation of high hardness to residual compressive stress. This gives great performance especially for highly stressed components and metal forming tools.

Advantages of BALINIT FUTURA NANO - TIAIN

- ► Optimised hardness to residual compressive stress ratio
  - Excellent coating adhesion
  - Ideal for highly stressed components
  - Uniform wear behaviour
- ► Better sliding properties due to higher surface quality
  - Enhanced demoulding and components surface quality
  - Improved chip flow
- ► Greater chemical and thermal stability
  - Dry machining and minimum quantity lubrication machining
  - Higher cutting speeds

BALINIT ALCRONA PRO - AlCrN-based

Universal machining at the highest level

Your tools are heavily stressed in production, with high mechanical and thermal strains. Nonetheless, productivity has to be increased. For these demands we created BALINIT® ALCRONA PRO, the top level all-rounder for cutting, punching and die casting. With this coating we were able to significantly excel the performance curve of the already proven BALINIT® ALCRONA. This results in an extremely wear resistant coating with excellent hot hardness and thermal shock stability. In short: The universal coating for superb results in dry and wet machining at high cutting speeds.

Advantages of BALINIT ALCRONA PRO - AlCrn-based

- ► Optimized process parameters and modified layer structure
  - Significantly strengthened performance profile
  - Broad application range
- ► Very high wear resistance and excellent hot hardness
  - Vastly improved tool lifetimes compared to conventional all-round coatings
- ► Very good thermal shock stability
  - Top results in both wet and dry machining and at the highest of cutting speeds
- ► Usable at significantly higher cutting speeds
  - Increased machine utilization and productivity
- ► AlCrN-based material composition
  - Groundbreaking all-round coating

PerformCoat

Cutting Edge Technology

Somta has invested in a Swiss-designed and manufactured PerformCoat PfC540 PVD coating machine. This machine has been developed in conjunction with OSG Japan and it now allows us to implement coating layers with adjustable properties for toughness, hot hardness, wear resistance, oxidation resistance and colour. These include mono, multi, nano and gradient coating structure.

This high-performance and innovative thin film coating technology will optimise tooling for machining applications of turning, deep-hole drilling, tapping, hard milling, hobbing and shaping of aluminium components (soft and hard with up to 12% Si) and machining of titanium and stainless steel.

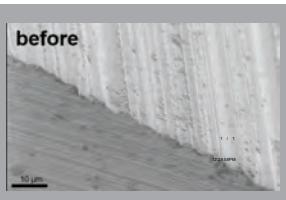
Benefits of PerformCoat PfC540 PVD coating machine

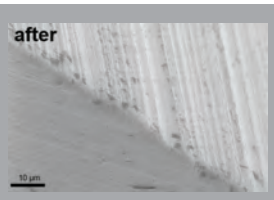
- Coatings with up to four different target materials
- Coating layers with adjustable properties for toughness, hot hardness, wear resistance, oxidation resistance, and colour
- Mono, multi, nano, and gradient coating structure
- Tightest coating thickness distribution in the industry
- Flexible combination of plasma as well as metal ion etching technologies
- Equipment customizable to required throughput and flexibility

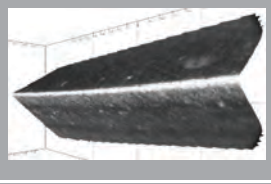
Somta has complemented this new high-tech development in our coating with a PerformDrag PfD550 polishing and honing machine. Referred to as drag finishing, this process increases the tool life and component finish quality by up to 80%.

Edge Preparation

- Create a well-defined hone
- Strengthen the cutting edge
- Avoid microchipping due to grinding
- Prepare edge for high performance coating
- Deburr HSS tools

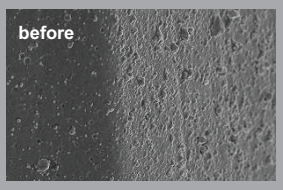


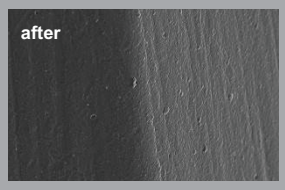




Polishing

- Improve the surface roughness by removing coating droplets
- Polish carbide tools prior to finish grinding
- Avoid build-up edge for machining of soft materials
- Achieve improved chip formation and chip flow





NEW Pfc (Performance) and HPfc (High Performance) options and variations

APPLICATION	Recommended Coating	Coating Thickness	Coating Hardness (Hv)	Max Operating Temperature (°C)	Coating Colour	Pre-Treatment	Post Treatment
Carbide Drilling in Hardened Steel over 52HRC	**HPfc Viscious**	2.2 - 2.7 µm	3500	1100	Red Brown	Yes	Yes
HSS Drilling	**Pfc AlTin**	3.0 - 3.5 µm	3300	930	Violet	-	-
Carbide Milling in Hardened Steel over 52HRC	**HPfc Viscious**	2.2 - 2.7 µm	3500	1100	Red Brown	Yes	Yes
Milling in Aluminium (Soft & high Si content)	**HPfc Alu**	2.6 - 3.0 µm	2200	760	Grey Violet	-	Yes
HSS Milling	**Pfc AlTin**	2.3 - 2.8 µm	3300	930	Violet	-	-
Tapping	Coming Soon						
Hobbing for conventional machining	**Pfc Tin**	4.0 - 5.0 µm	2800	700	Gold	-	-
Hobbing for CNC machining	**Pfc AlTin**	3.0 - 4.0 µm	3300	930	Violet	-	-
Mould & Die (Hard Steel)	**Pfc CrN**	2.0 - 2.5 µm	2700	760	Grey	-	Yes
Mould & Die (Soft Materials)	**Duplex (Nitride + other Coating)**	Up to 50 µm + up to 10 µm other Coating	Depending on Material being moulded			-	Yes
Punching, Stamping and Forging	**Pfc AlTin (50/50)**	3.0 - 4.0 µm	3300	930	Violet	-	Yes
	Duplex (Nitride + other Coating)	Up to 50 µm + up to 10 µm other Coating	Depending on Application			-	Yes
Plastic Moulding	**Nitride only**	Up to 50 µm	-	-	-	-	Yes
Wear Components	**HPfc Cera Chrome (DLC)**	2.5 - 3.5 µm	2600	800	Dark Grey	-	-

All given data are approximate values, they depend on application, environment and test conditions.

PerformCoat

Cutting Edge Technology

HPfC Viscious

High Performance Coating for Hard Machining

HPfC Viscious
is designed for machining hardened steel (> 52 HRC) in dry or mist lubricant conditions.

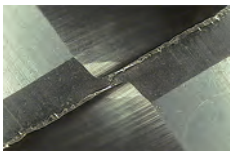
Versions with optimized coating composition and thickness for drilling, roughing, finishing and microtools are available.

Performances:

HPfC Hardmill

Competitor A

Competitor B



wear after 30 meter machining
hard machining D2 at 60 HRC
dia 8 mm; Vc 200 m/min; fz 0,12 /tooth, ap 3 mm; ae 0,5 mm; dry air blow

Increase the Performance of Your Hard Machining Tools

Properties

- » high heat and wear resistance at the cutting edge
- » hot hardness
- » very high oxidation resistance (>1100°C)
- » low thermal conductivity

PerformCoat

Cutting Edge Technology

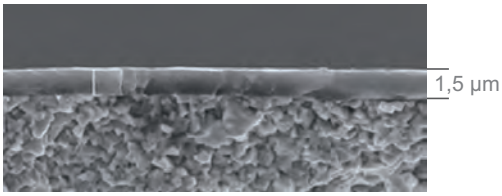
HPfC Alu

High Performance Coating for Aluminium Machining

HPfC Alu
is designed for soft aluminium, as well as aluminium alloys with low and silicon in dry, mist or wet lubricant conditions.

is based on multilayer structure with low friction coating on top to avoid built up edges. It has a wear and heat resistance matrix.

is suitable for milling, drilling including deep hole, tapping, turning and gear cutting.



HPfC Alu structure

Increase the Performance of Your Aluminium Machining Tools

Properties

- » no built up edge
- » low friction
- » heat resistance required in HSM and deep drilling
- » wear resistance for AL alloys with high Si content

Manufacturers & Suppliers

of Drills, Reamers, End Mills,

Bore Cutters, Taps & Dies,

Toolbits, Solid Carbide Tooling,

Carbide Insert Tooling,

Custom Tools and

Surface Coatings

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World Class Cutting Tools

OSG GROUP COMPANY

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