SULZER

Sulzer Metco

MAXIT® AlTiN

PVD High-Performance Coating

AlTiN

MAXIT® AlTiN Coatings:

The development of AlTiN focused on the ability of being able to use such coatings universally within the area of cutting technology. The selection of this material was based on different aspects:

- The hardness of AlTiN is significantly higher than that of TiN.
- AlTiN exhibits a very high degree of oxidation resistance compared to TiN or TiCN coatings, which even increases with increasing aluminium content. This is of special importance in the area of high-speed and dry cutting.

AlTiN coatings are well proven in the machining of case hardened and heat treated steel as well as grey cast iron.

Moreover, tools coated with AlTiN excel through excellent adhesive strength and wear resistance during metal forming operations, in particular during calibration and during massive forming, which partly involve extremely high shear stresses.

MAXIT® AlTiN characteristics:

- Monolayer
- Coating thickness 1 to 5 µm
- High degree of oxidation resistance
- Very good adhesion
- Solvent resistant
- Insensitive to fingerprints

Typical areas of application:

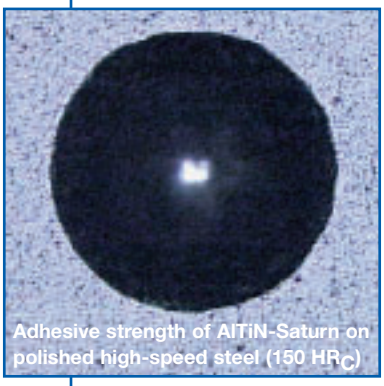
- Metal forming tools
- Cutting tools
- Medicinal technology
- Decorative applications

Properties	Coating material						
	AlTiN	**AlTiN-Saturn**	**AlTiN-mod**	**CrN**	**TiN**	**TiCN**	**ZrN**
Hardness HK	2700 - 3100	2900 - 3400	2900 - 3400	2100 - 2500	2300-2800	2800 - 3300	2200 - 2600
Max. operating temp./°C	800	900	500	650	500	400	550
Ductility	satisfactory	good	satisfactory	very good	good	satisfactory	satisfactory
Colour	anthracite	anthracite-violet	light gold	steel grey	gold	grey, copper	light gold

AlTiN-Saturn

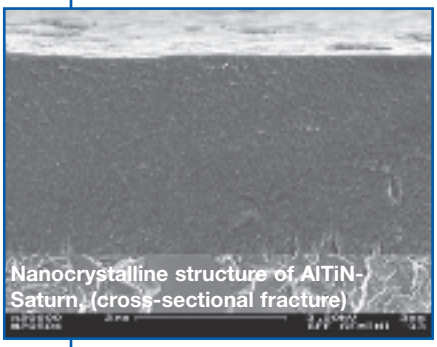
MAXIT®
Wear Protection

MAXIT® AlTiN-Saturn:
AlTiN-Saturn represents for cutting tools the optimum coating which excels through a nanocrystalline structure. This structure effects, besides the high degree of toughness, a specially high surface quality making this coating universally usable in the machining of numerous iron and steel materials, titanium and nickel alloys.



Adhesive strength of AlTiN-Saturn on polished high-speed steel (150 HR_C)

AlTiN-Saturn characteristics:
- Monolayer
- Coating thickness 1 to 5 µm
- High aluminium content
- Extremely high oxidation resistance
- Very smooth surface
- Nanocrystalline morphology
- Excellent adhesion
- Combination of high hardness and fracture toughness



Nanocrystalline structure of AlTiN-Saturn, (cross-sectional fracture)

Typical areas of application:
High-performance cutting of
- Tool steel (up to 63 HR_C)
- Stainless steel
- Grey cast iron
- Heat treated steel
- Titanium and nickel alloys

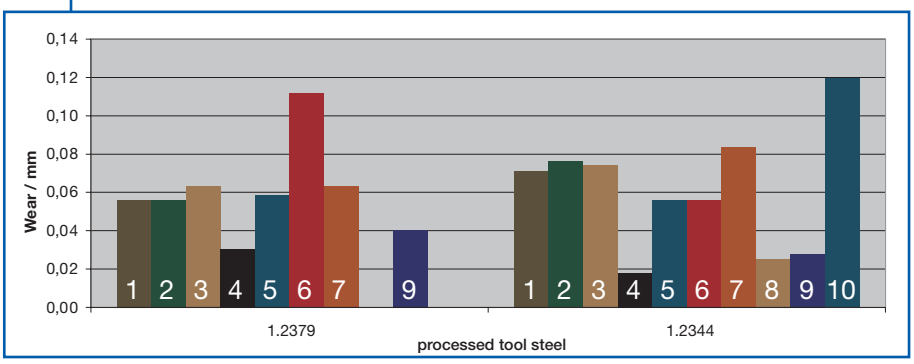
Surface of AlTiN-Saturn on a micro-blasted indexable insert

Test conditions:
Material:

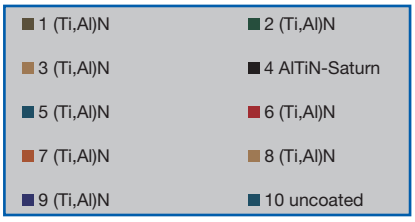
1.2379	1.2344
X155CrVMo12-1	X40CrMoV5-1

Machining parameters (dry cutting):

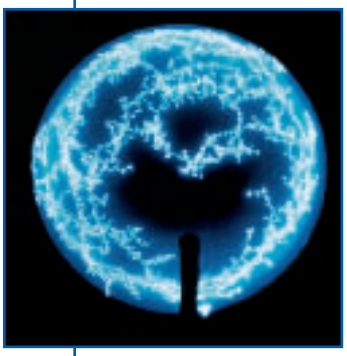
v_c	= 113 m/min	189 m/min
f_z	= 0.08 mm/t	0.13 mm/t
a_p	= 0.23 mm	0.23 mm
a_e	= 1.5 mm	1.5 mm



Material:
Carbide ball nose end mill



Process

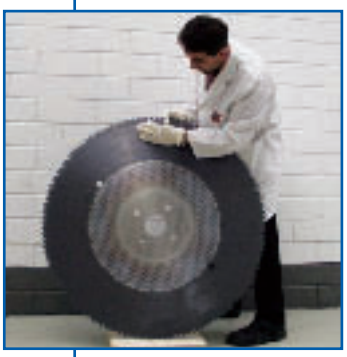


The aluminium titanium nitride (AlTiN) coatings developed by Sulzer Metco are deposited using the Arc process.

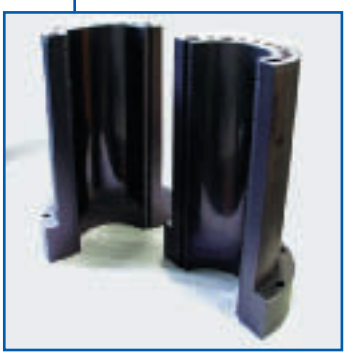
The important advantage of the Arc process compared to sputtering is the considerably higher energy density of the plasma during the deposition process. Ionisation degrees of up to 100% ensure in the case of the Arc process significantly higher hardness and density as well as better adhesion of the wear protection layers compared to sputtering. These are important parameters for improving the operative properties of cutting tools, for example. Whereas the degrees of ionisation of typical sputtering processes amount to only 10 to 15% and even when using the most modern sputtering processes which are capable of attaining ionisation degrees of up to 40% it is, due to the principle employed, not possible to attain the properties of Arc coatings.

The high aluminium content effects during operation the formation of a thin oxidation protecting Al_2O_3 film at the surface of the coated tool, which constantly renews itself during usage. In particular, in connection with the high density this results in an improved resistance of the AlTiN-Saturn coatings against oxidation compared to conventional TiAlN layers.

Due to their high aluminium content, AlTiN-Saturn coatings are electrically and thermally insulating. They permit operating temperatures of up to 900° C.



An excellent property of AlTiN-Saturn is its nanocrystalline structure allowing for a very high degree of coating hardness combined with excellent fracture toughness. AlTiN-Saturn coatings are deposited in a nanocrystalline globulitic structure, in contrast to the for PVD coatings otherwise common columnar - more coarse crystalline morphology. Owing to the dense nanocrystalline structure, inward diffusion of oxygen is prevented in addition, thereby extremely increasing oxidation resistance.



For applications in the area of hard machining, the process is controlled such that in the areas of the coatings close to the surface, a state of residual compressive stress is attained.