



PVD coatings

properties and applications

	TiN	TiCN	VARIANTIC nanoVARIANTIC	CrN CrCN	ZrN	SUPRAL SUPRAL plus	EXXTRAL cut EXXTRAL form	EXXTRAL silver*	EXXTRAL blue	SISTRAL	SISTRAL platinum*	WC/C
Coating Material	Titaniumnitride	Titanium Carbonitride	Titaniumaluminium Carbonitride	Chromiumnitride, Chromcarbonitride	Zirconiumnitride	Titanaluminium- Nitride (TiAlN + WC/C)	Aluminium- Chromiumnitride	Aluminiumtitanium- Chromiumnitride	Aluminium Titaniumnitride (with additions)	Aluminium Titaniumnitride (with additions)	Aluminiumtitaniumnitride- Zirconiumnitride	Tungsten Carbide - Carbon
	TiN	TiCN (ML)	TiAlCN (ML)	CrN CrCN	ZrN	TiAlN (ML)	AlCrN (ML)	AlTiCrN (stacked)	AlTiN (stacked)	AlTiN (nanostructured)	(nanostructured)	a-C : Me
Technology	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Microhardness HV _{0,05}	2300 ± 300	3500 ± 500	3500 ± 500	2000 ± 200 2300 ± 200	2800 ± 300	3500 ± 500	3200 ± 300	3000 ± 300	3500 ± 500	3400 ± 500	3500 ± 500	1000 - 2200
Friction Coefficient Against Steel (Dry)	0.6	0.2	0.2	0.3 - 0.4 0.2 - 0.3	0.5	<0.5	0.45	0.4	0.7	0.7	0.5	0.2 - 0.25
Coating Thickness ¹⁾	1 - 4	1 - 4	2 - 4	2 - 6	1 - 4	2 - 4	2 - 5	2 - 4	1 - 3	1 - 4	2 - 4	2 - 5
Thermal Threshold	500°C 900°F	400°C 750°F	800°C 1470°F	600°C 1100°F	600°C 1100°F	800°C 1470°F	1100°C 2012°F	800°C 1470°F	900°C 1650°F	900°C 1650°F	900°C 1650°F	400°C 750°F
Colour of the	gold	blue grey (anthracite)	old rose	silver - grey	pale yellow	black	grey	silver	blue-violet	anthracite	pale yellow	anthracite
Key Characteristics	standard, all-purpose coating, biocompatible	high hardness, good wear resistance, enhanced toughness	low friction, high oxidation resistance	low stress / good adhesion, high toughness and corrosion resistance	high hardness, decorative color, good wear and corrosion resistance, biocompatible	universal application for drilling and cutting, high hardness, very good oxidation resistance and low friction	high performance coating, very high hardness, for very high temperatures, excellent oxidation resistance and adhesion, smooth surface	high hardness & wear resistance, high oxidation stability, low coefficient of friction	high hardness & wear resistance, excellent oxidation resistance	high performance coating, extreme wear resistant at high temperature, excellent oxidation resistance	Composite of Sistral and ZrN, high performance coating	high lubricity, low tendency for adhesive wear
Primary Applications	<ul style="list-style-type: none"> machining / cutting of iron based materials metal forming plastic moulding visual refinement medical technology food industry 	<ul style="list-style-type: none"> machining of difficult-to-machine alloy steels high performance cutting where moderate temperatures are generated at the cutting edge excellent for metal forming (stainless steel) 	<ul style="list-style-type: none"> coating for a wide range of carbide, cermet and high speed steel tooling machining of all types of steel under dry as well as wet machining conditions excellent for drilling in steel milling drawing, stamp-ing, punching, forming tools for processing of high and low alloy steel 	<ul style="list-style-type: none"> machining copper and other non-ferrous materials metal forming plastic moulding (improved demoulding) aluminium and magnesium die casting 	<ul style="list-style-type: none"> cast aluminium and generally non-ferrous materials machining cutting of aluminium with Si-share <10% machining of titanium machining of fibreglass, nylon and most polymer materials forming and punching - reduced cold rewelding medical applications decorative industry 	<ul style="list-style-type: none"> coating for a wide range of carbide, cermet and high speed steel tooling machining of cast iron and nickel based high temperature alloys high speed operations, semi-dry or dry machining drilling under extreme application terms (bad cooling, without internal cooling) excellent for drilling operations in steel (up to 45 HRC) milling forming 	<ul style="list-style-type: none"> punching & forming cutting milling high performance cutting dry machining all-purpose <50 to >60 HRC milling of difficult-to-machine materials excellent for hardened and low alloy steels > 60 HRC cast iron Al pressur casting 	<ul style="list-style-type: none"> machining of Al-alloys and non-ferrous metals processing of abrasive materials or materials tending to welding (stainless steel, gray cast, iron, Si-rich Al alloy) cutting of aluminium with Si-share >10% high performance cutting operations, dry or minimal lubrication machining for aluminium and magnesium casting high thermal load limit very good performance on inserts 	<ul style="list-style-type: none"> machining of hardened steel work pieces, gray cast iron, Si rich Al-alloys (> 55 HRC) high performance cutting operations, dry or minimal lubrication machining 	<ul style="list-style-type: none"> best choice for cutting under extreme conditions (hard, abrasive materials, high speed, dry cutting) machining of hardened steel (> 55 HRC) inconel machining very good performance on punches 	<ul style="list-style-type: none"> cutting under extreme conditions high performance cutting of very abrasive materials inconel machining very good performance on inserts machining of titanium 	<ul style="list-style-type: none"> precision components punching & forming, minimal lubrication or dry plastic injection & moulding moving parts, dry
							* NEW!	* NEW!			* NEW!	

1) depends on size of tools,
for micro tools also smaller
thicknesses necessary





PVD coatings

application recommendation for different groups of material

for CUTTING TOOLS

	non ferrous materials (aluminium, titanium, copper, zinc, bronze, brass,...)	low alloy steel < 1000N/mm	high alloy steel cast iron inconel	hardened steel >55 HRC
1.	Zirconiumnitride [m]	TiN [d,m]	SUPRAL [d,m]	EXXTRAL cut [m]
2.	EXXTRAL silver [m,d]	TiCN [d,m]	VARIANTIC [d,m]	SISTRAL [m]
3.	SISTRAL platinum [m]	VARIANTIC [d,m]	EXXTRAL cut [m]	SISTRAL platinum [m]
4.		SUPRAL [d,m]	SISTRAL [m]	EXXTRAL silver [m,d]
5.		EXXTRAL cut [m]	SISTRAL platinum [m]	
			EXXTRAL silver [m,d]	

Focus: [d] ... drilling
[m] ... milling

You can find more information about our coating systems on our web page, in our product catalogue and on our index for coating systems (PVD coatings - properties and applications).



PVD coatings

application recommendation
for different groups of material



for punching and forming

		PUNCHING		FORMING		
↓ material ↓		punching	(precision/fine) blanking	sheet/cold-forming	massive-forming	hot-forming
sheet steel	non-alloy	TiN TiCN	TiN TiCN	TiN TiCN	TiCN VARIANTIC	TiAlN
	low-alloy < 1000N/mm	TiCN VARIANTIC EXXTRAL form SISTRAL	TiCN VARIANTIC EXXTRAL form SISTRAL	TiCN VARIANTIC EXXTRAL form	VARIANTIC EXXTRAL form	EXXTRAL form
	high-alloy > 1000N/mm	EXXTRAL form SISTRAL	EXXTRAL form SISTRAL	EXXTRAL form VARIANTIC DUMATIC	EXXTRAL form DUMATIC	EXXTRAL form
	galvanise	CrWCC	CrWCC	CrWCC	CrWCC	-
	stainless steel	EXXTRAL form TiCN SISTRAL	EXXTRAL form TiCN SISTRAL	EXXTRAL form TiCN DUMATIC	EXXTRAL form TiCN DUMATIC	EXXTRAL form
non-ferrous materials	aluminium	CrCN	CrCN SISTRAL platinum	CrCN CrWCC	CrCN CrWCC	CrCN EXXTRAL form
	aluminium alloys	CrCN Zirconiumnitride	CrCN Zirconiumnitride	CrWCC EXXTRAL form	CrWCC EXXTRAL form	EXXTRAL form
	titan alloys	CrWCC CrCN	Zirconiumnitride	CrWCC EXXTRAL form	CrWCC EXXTRAL form	EXXTRAL form
	copper, brass	CrCN Zirconiumnitride	CrCN Zirkoniumnitrid	CrCN CrWCC	CrCN CrWCC	CrCN EXXTRAL form
	polymer	Zirconiumnitride CrCN (high glass fibre content >6μ)	Zirconiumnitride CrCN (high glass fibre content >6μ)	-	-	-

* DUPLEX - after arrangement with the customer

! From a material strength to be worked on up to 1. 2 mm we recommend DUPLEX-coating !

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